

All Comments and Questions with Answers

From the most recent to oldest

Q I have just read "a guide to climate change" in which there is mention of the differing isotopes of carbon. It is suggested that only 20 ppm of atmospheric CO₂ is created by fossil fuels - can you comment and advise (9/20/10)

A I wonder who wrote this "guide". The amount of CO₂ in the atmosphere is a balance of interactions involving carbon exchanges between the atmosphere, oceans, and terrestrial biosphere. When more CO₂ is put in than oceanic and biospheric processes can remove, the result is an increase in atmospheric CO₂, as has been observed. However, not all isotopes move through the system at the same rate, and this needs to be accounted for. My initial guess is that it wasn't. T.J. Blasing

Q I am looking for CO₂ measurements made at Halley Bay (or other Antarctic site) in 2009 to compare with GEOS-Chem model results. Can you direct me to such a time series? Thank! (9/10/10)

A Dear Coleen, The National Oceanic and Atmospheric Administration (NOAA) collects flask air samples at Halley Bay for analysis back at the NOAA laboratory in Boulder, Colorado. The data are available at <ftp://ftp.cmdl.noaa.gov/ccg/CO2/flask>. The data are described at ftp://ftp.cmdl.noaa.gov/ccg/CO2/flask/README_surface_flask_CO2.html. The list of available stations, including Halley Bay (HBA), are provided at http://www.esrl.noaa.gov/gmd/dv/site/site_table.html#ccg_surface. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I downloaded the CO₂ -emission data of nearly all countries in the world, calculating the remaining countries as the difference between the regional totals and the bigger countries I downloaded individually. However, adding up all countries and the emissions from groups of remaining countries, I was left with a difference with the global total emission data. The global difference I found, seemed to correspond with the emission data of bunker fuels. Bunker fuels are mentioned separately in the national emission data, but are absent in the regional and global emission data. After some test-calculations, I came to the conclusion that, although bunker fuels are not included in the regional emission data, they are included in the totals of the global emission data. My question is if you can confirm this. Kind regards, Hans (9/2/10)

A You have figured it out correctly. Countries are calculated individually, regions are the sum of countries, the global total is calculated separately. The global total actually differs from the sum of countries for 4 reasons, the most important of which is that bunker fuels are not included with any country. It is also true that globally the sum of imports of any given fuel is seldom exactly the same as the sum of exports for the same fuel, our estimates of the extent to which non-fuel uses (asphalt, lubricants, solvents, etc.) of fuels are oxidized to CO₂ is done differently for countries and for the global total, and there are differences in which way countries treat the change in stocks (the amount of coal in piles at powerplants, etc.). As you noted, bunker fuels is the dominant component, but you will still not get an exact match. Good show, Gregg

[Hans replies...] Thanks for the confirmation (and the compliment) Gregg. A suggestion as a feedback: Wouldn't it be more consistent to specify bunker fuels on all levels: nationally, regionally and globally? The other three reasons you mention are not very significant indeed (I noticed the not-100% match, but they were an order or two less in magnitude compared to bunker fuels), so adding them to 'bunker fuels' and explaining them in a footnote would be sufficient. Kind regards, Hans

Q I am looking for the data of "Historical Global CO₂ Emissions (1850-2004)" by Marland et. al (2007) Global, Regional, and National CO₂ Emissions In Trends: A Compendium of Data on Global Change. CDIAC U.S.A. The following is the URL of the graphic <http://www.pewclimate.org/facts-and-figures/international/historical>. I found "Global Fossil-Fuel CO₂ Emissions" at your site (http://cdiacornl.gov/trends/emis/tre_glob.html). However, the numbers of "Historical Global CO₂ Emissions (1850-2004)" and "Global Fossil-Fuel CO₂ Emissions" seem different. Would you tell me why those numbers are different? In addition, could you tell me where I can get the data of "Historical Global CO₂ Emissions (1850-2004)". Thank you so much for your cooperation (8/22/10)

A Hi Kana, For the latest global, historical fossil-fuel CO₂ emission time series from CDIAC please go to http://cdiacornl.gov/ftp/ndp030/global.1751_2007.ems. The numbers shown on the Pew site may be in CO₂ units while ours are reported in carbon units. To convert, simply multiply our estimates by 3.667. Thanks, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[Kana replies...] Dear Tom, Thank you so much for your quick reply. Your response was useful to clear up my questions. Sincerely, Kana Ohashi

[TJ answers also] Answer: The first link you gave does not connect to our site; it connects to a PEW-Center site and they have

multiplied our numbers by 3.67 so as to include the weight of the oxygen atoms in the CO₂ molecule. We give numbers for carbon emissions only. The data from the second link you give below is now updated through 2007 and goes back to 1751, so it includes 1850-2004. T.J. Blasing

[and Kana replies..] Thank you so much for your reply. I could clarify my questions. Best regards, Kana Ohashi

Q Dear Sir/Madam, Good day! My name is Tom and I own the website <http://www.tiptheplanet.com/> which is one of the most comprehensive green Wikis on the Internet right now. I see that you are putting environmental tips on your website and it's good to see that a lot of people are doing their part in helping save the environment. With this regard, may I invite you to share your expertise and edit articles on my site as you see fit. Please share tips and include a link to your website when necessary. It will help you reach out to your customers and the rest of the world with your tips. Also, feel free to use the tips and articles on the website as reference. Please also help me share the word about the green wiki by sharing our link on your site as the reference of the tips. For example, you can add information from our site to this page on your site <http://cdiac.ornl.gov/climate/variables.html>. You can refer to this page for information http://www.tiptheplanet.com/wiki/Climate_change. If you would like any more info, don't hesitate to email us at info@tiptheplanet.com. Have a nice day! Thanks, Tom (8/20/10)

A Hi Tom, Thanks for your invitation and good luck with your website. My workload will likely not afford me time to edit articles on your site. You are welcome to link to our website and I will monitor your site periodically for relevant information suitable for our users. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q how do you get the carbon emission for Malaysia? does it from Malaysian government? (8/20/10)

A Dear Nur Atiqah, Our Malaysian fossil fuel CO₂ emission estimates are based primarily on energy statistics reported by the Malaysian government to the United Nations, who assemble a global database on energy production, trade, and consumption. In short, the base data from the UN via sources in Malaysia. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Mr. Kaiser, Is the data for 2010 not posted until the end of the year? If so is there any way of accessing that data early? I am looking for data from one site in Ohio (Hillsboro) between 1 October 2009 and 31 March 2010. Thanks in advance for the help. Adam K. Janke (8/18/10)

A Adam, Yes, we here at CDIAC update USHCN once each year. But you can acquire Global HCN (GHCN) data (including this station and the other USHCN stations) from NCDC w/o the help of a GUI. Just go here <http://www.ncdc.noaa.gov/oa/climate/gHCN-daily/> and read the GHCN Daily readme file for instructions on how to download an individual station's data. Holler if you have any problems. Dale Kaiser Carbon Dioxide Information Analysis Center Environmental Sciences Division Oak Ridge National Laboratory (865) 241-4849 kaiserd@ornl.gov

Q In studying a paper on CO₂ from fossil fuels it was quoted that since 1751, 337 billion tons of carbon have been released. My question is how big is 337 billion tons of carbon. Is that a dry or liquid measurement? If it were a liquid, would it fill up say Lake Erie or just a small pond. If it were a dry weight would it weigh more than say Mount Rushmore or the Empire State Building. I am trying to get a physical reference point to teach my students about the amount of Carbon released. Jeremiah (8/16/10)

A Jeremiah, Your numbers are correct through 2007; the "official preliminary" numbers through 2009 are closer to 354 Pg-C. I would prefer that you not use a realistic analogy; liquid carbon does not exist at the temperature and pressure of Lake Erie. Having said that, what grade level are your students? I don't want to give a college level answer to 2nd graders, or vice-versa. T.J. Blasing

Q Hi, I was wondering if there were any USHCN stations in Alaska. If so, how can one access the data for those stations? Thanks Stephanie McAfee (8/11/10)

A Stephanie, There is an old Alaskan USHCN database that we have that extends through 1990 <http://cdiac.ornl.gov/ndps/db1004.html>. I don't know of any explicit updates to this by our colleagues at NCDC, who have been the compilers of all things USHCN. But, I'm attaching a file with future "candidate" Alaskan USHCN stations (that may eventually conform to the modern day HCN standards) I got from a colleague at NCDC. Using this file, you can go to <http://www.ncdc.noaa.gov> and click on the link "Find a Station", and search in various ways. The data for these stations should be downloadable but don't hesitate to use NCDC contact info. from their site if you have any trouble. Oh, variables in the attached file are Coop station number (2-digit "state" followed by unique 4-digit station ID), lat, lon, elevation (meters, I think), and of course station name. Good luck, Dale Kaiser Carbon Dioxide Information Analysis Center Environmental Sciences Division Oak Ridge National Laboratory (865) 241-4849 kaiserd@ornl.gov <http://cdiac.ornl.gov> 500280, 61.2000, -150.0000, 40.0, ANCHORAGE TLAP 500546, 71.2900, -156.7600, 9.0, BARROW WSO AIRPORT 500754, 60.7900, -161.8300, 31.0, BETHEL AP 500761, 66.9200, -151.5100, 196.0, BETTLES AP 500770, 63.9900, -145.7200, 386.0, BIG DELTA FAA/AMOS AP 502102, 55.2200, -162.7300, 24.0, COLD BAY AP 502107, 64.8600, -147.8400, 189.0, COLLEGE OBSERVATORY 502177, 60.4900, -145.4500, 9.0, CORDOVA AP 502607,

64.7900, -141.2000, 259.0, EAGLE502707, 64.6700, -147.1000, 167.0, EIELSONFIELD503465, 62.1600, -145.4600, 479.0, GULKANAAP 503665, 59.6400, -151.4900, 20.0, HOMERAP 504590, 55.3600, -131.7100, 23.0, KETCHIKAN504766, 58.6800, -156.6500, 14.0, KING SALMONAP 504812, 58.1900, -152.3700, 18.0, KITOIBAY 505076, 66.8900, -162.6000, 3.0, KOTZEBUEWSO AIRPORT505519, 56.3900, -134.6600, 4.0, LITTLE PORT WALTER 505733, 61.5700, -149.2500, 52.0, MATANUSKAAES 505769, 62.9600, -155.6100, 101.0, MCGRATHAP 505778, 63.7200, -148.9700, 631.0, MCKINLEYPARK 506496, 64.5100, -165.4400, 4.0, NOMEWSO AIRPORT506586, 62.9600, -141.9300, 522.0, NORTHWAYAP 507570, 60.2000, -154.3200, 79.0, PORT ALSWORTH507783, 62.0900, -152.7400, 558.0, PUNTILLA508118, 57.1600, -170.2200, 11.0, ST PAUL ISLANDAP 508371, 60.1000, -149.4400, 34.0, SEWARD508494, 57.0500, -135.3600, 4.0, SITKAJAPONSKIAP 508547, 62.7100, -143.9800, 668.0, SLANA508976, 62.3200, -150.1000, 107.0, TALKEETNAAP 509313, 63.3500, -143.0400, 494.0, TOK 509641, 64.8600, -147.8600, 145.0, UNIVERSITYEXP STA 509685, 61.1300, -146.2400, 32.0, VALDEZMUNICIPALAP 509919, 56.4800, -132.3700, 13.0, WRANGELLAIRPORT509941, 59.5100, -139.6300, 9.0, YAKUTATWSO AIRPORT

Q RE: NASA GISS Surface Temperature (GISTEMP) Analysis- Data Tables of Global, Hemispheric and Zonal Temperature Anomalies When you speak of temperature "Anomalies" - is this variation in temperature from the mean temperature? Anthony Hespeth (8/9/10)

A Dear Anthony Hespeth, We appreciate your question to the CDIAC Web site. You're exactly correct. By anomalies we mean departures from the mean of a particular "reference" period. In Hansen et al.'s case, this reference period mean is computed over the years 1951-80. <http://cdiacornl.gov/trends/temp/hansen/hansen.html> Sincerely, Dale Kaiser CDIAC

Q Hi, I find the CDIAC just can download Fossil Fuel CO₂ Gridded Annual Estimates (1 x 1) before 2007. How can I get the latest data? Thank you. (8/5/10)

A 2007 is the most recent year for which we have gridded emissions data. We do have preliminary estimates that we can share of national emissions for many countries and for the global total for 2008 and 2009 if these would be useful to you. Best wishes, Gregg

Q Hello I need the total emissions of CO₂ in part per million (ppm) unit. Thanks for your help with best regards Ali Binesh (8/4/10)

A Ali: Here is some background on how I obtained some of my numbers. I hope they will answer your question. The average weight of a molecule in the air is approximately $32 \times 0.2 + 28 \times 0.8$, where 32 and 28 are the molecular weights of oxygen and nitrogen and 0.2 and 0.8 are the fractions of the atmosphere that are oxygen and nitrogen, respectively. Actually, the average molecule is a bit heavier than that because I didn't account for the argon, which is heavier. The actual average is around 29. I use ppmv to indicate a volume fraction, and ppm to indicate a mass fraction. Because CO₂ molecules are heavier than average air, an increase in CO₂ of 1 ppm will raise the volume by less than 1 ppmv. The conversion ratio is the molecular weight of air (29) divided by the molecular weight of CO₂ (44) = 0.659 ppmv. If the mass of the atmosphere were 1 million petagrams (one petagram is a billion metric tons) then a millionth part of that, or 1 petagram of CO₂ would raise the concentration by $29/44 \text{ ppmv} = 0.659 \text{ ppmv}$. The mass of the atmosphere is 5.14 million petagrams, so a scaling factor of 5.14 is needed to allow the petagram of CO₂ to mix through such a large atmosphere. $5.14 \text{ petagrams} = 0.659 \text{ ppmv}$, so 1 petagram = 0.128 ppmv, or 7.8 Pg = 1 ppmv. That is, 7.8 petagrams of CO₂ will produce a 1 ppmv increase. For any of your colleagues who might be studying the carbon cycle, 7.8 petagrams of CO₂ is 2.12 petagrams of carbon. The above figures apply if: (1) the CO₂, or at least the carbon in the CO₂, is distributed evenly throughout the atmosphere and (2) it all stays in the atmosphere. (1) is pretty accurate if you allow time for it to get into the stratosphere. (2) is not accurate; about half the added CO₂ goes into the oceans or the terrestrial biosphere. How long the oceans and terrestrial biosphere will continue to remove that fraction of emitted CO₂ is unknown, so several researchers are studying the global carbon cycle to see what determines the removal of CO₂ from the atmosphere. Each year about 35 petagrams of CO₂ are emitted by human activities, including land use changes. This would be about $35/7.8$ or 4.5 ppm. If you don't count land use changes but only count fossil carbon, then about 30 petagrams of CO₂ are emitted to the atmosphere each year, for an increase of about 3.85 ppm. Measurements at Mauna Loa and other places show that annual increases in atmospheric CO₂ concentration have averaged around 2 ppm over the last 5 years, or about half the amounts that would occur if all the emitted CO₂ stayed in the atmosphere. The fraction remaining in the atmosphere (airborne fraction) changes from year to year. You can probably check the web for more information about that. Fossil CARBON (NOT CO₂) emissions for the world and country-by-country are given at: http://cdiacornl.gov/trends/emis/overview_2006.html Peace, T.J. Blasing

Q Since anthropogenic CO₂ emissions are being labeled as the cause for "global Warming"... What cause(s) is/are attributed to the CO₂ concentration spikes (as documented in the Vostok Petit core samples 1999) occurring at approx 10,000, 20,000, 140,000, 240,000 and 325,000 years ago? (8/4/10)

A Dear K. Dixon, We appreciate your question to the CDIAC Web site. The very best and comprehensive answers to your questions can be found in the IPCC report found here: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/content.html For your paleoclimate questions, please see chapter 6. This report uses all the published literature that's out there to summarize what researchers have come to learn about temperature and CO₂ relationships in the past. Sincerely, Dale Kaiser CDIAC

Q following parameters available in historical weather data? - Temperature- Wind Speed- Solar Radiation- Relative Humidity Hoping to receive a positive response from your side. Thanks & Regards Kamal Sayal +919899185895(7/30/10)

A Hi Kamal, I will answer your questions specifically below.... On Jul 30, 2010, at 5:44 AM, <kamal.sayal@accenture.com> wrote Hi Dale Myself is Kamal, working with Accenture Services Pvt Ltd, India. I am currently working on a project for Accenture USA where we require US/Europe weather historical/past data. I visited the USHCN website and have a few queries regarding that and it would be very helpful if you resolve my following queries. 1. Is the data download free or paid? Free, absolutely 2. Is the data available for US only or Europe as well? USHCN is strictly 48 United States. European data can be obtained here: <http://www.ncdc.noaa.gov/oa/climate/ghcn-monthly/> <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/> 3. Is the data available for every city/state in US? 1218 stations scatter around all but the few smallest United States <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> http://cdiac.ornl.gov/ftp/ushcn_v2_monthly/ushcn-station.txt 4. Is the data available through FTP and Manual Download functionality only or there is any web service also for access of historical weather data? Via ftp and our GUI here: http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn_map_interface.html 5. Are the following parameters available in historical weather data? - Temperature- Wind Speed- Solar Radiation- Relative Humidity From USHCN, only temperature precipitation, snowfall amount, and snow depth. For GHCN, referred to above, temperature precipitation, and sea-level pressure. The other variables would be contained in more disparate datasets from NCDC (<<http://www.ncdc.noaa.gov>>). Regards, Dale Kaiser Environmental Sciences Division Oak Ridge National Laboratory (865) 241-4849 kaiserdp@ornl.gov

Q For a study, I am comparing CO₂ emissions across countries. I am surprised that your data seems to differ significantly from that published by the European Union. Do you know why this is the case? (7/26/10)

A I suspect you are seeing that our numbers are reported in units of carbon whereas some others report units of carbon dioxide. Multiply our numbers by the ratio of the molecular masses, 3.67, and see if they then agree. Gregg

Q Is it true that 95% of global warming is from water vapor, 5% from greenhouse gases, only .28% of global warming is from man-made greenhouse gases, so 99.72% of global warming is natural? (7/26/10)

A I would say that it depends on how you choose to define global warming. If by global warming you mean the difference between the temperature of the Earth with no atmosphere at all and the temperature of the Earth at the beginning of the industrial revolution, then these numbers are probably on the right order of magnitude. If by global warming you mean the change in the climate system between the beginning of the industrial revolution and now (which is how I would define it), then these numbers are not correct. Gregg

Q It has been projected that fossil fuel reserves will be depleted by the year 2100. What would the carbon dioxide levels be if all fossil fuel reserves were consumed by the year 2100? I see no scenario in which we will leave oil or coal in the ground unused, so whatever conservation steps we take, all fossil fuels will be consumed. It is only a matter of time and it is unlikely that time frame will extend beyond the end of this century. (7/26/10)

A Well, I don't know who made this projection. We are currently putting about 8.5 Pg of carbon in the atmosphere (a Pg is a billion metric tons, sometimes called a gigaton, or Gt). If we do that for the next 90 years, the total will be around 765 Pg. Geologists think as much as 5400 Pg of carbon may be down there somewhere. However, much of that is not likely to be extractable even with futuristic technology. Estimates of reserves (extractable with current technology) change as "current technology" advances, as you astutely noted, so I'm not sure that our reserves will be exhausted by 2100. Also, the 8.5 pg/year figure is likely to increase. There is also doubt about how much of the carbon injected into the atmosphere will stay there. Currently about half of it does, and the rest goes into the atmosphere and oceans, but that fraction is roughly varies from year to year, and its average could change. Assuming that fraction stays the same, 1000 Pg of carbon (as CO₂) are injected and 500 stay in the atmosphere, concentrations would increase by about 250 ppm, to about 640 or so. For a range of much more sophisticated estimates, I refer you to: http://www.ipcc-data.org/ddc_CO2.html 640 ppm is about midway within that range. TJ Blasing

Q Dear Sir/Madam, Based on the data available on your website, I calculated the CO₂-equivalent concentration based on the sum of the extra radiative forcing from other greenhouse gases, to be 469 ppm. Have you estimated this? Kind regards (7/23/10)

A You can find similar computations in the IPCC Assessment reports, but we have not done it here.

Q 2005 to the present... Might you be able to recommend how I go about this? Thanks so very much! (I need to get the info for Hopewell, New Jersey). Specifically, I am looking for DAILY precipitation amounts so that I can determine when rain events occurred. Sincerely, Judy Jengo (7/20/10)

A Hi, I can think of two options: <http://www.ncdc.noaa.gov/oa/climate/stationlocator.html> "Hopewell" does not turn up anything in the search, so you might try nearest zip codes. Or, choose closest station using our interface: http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn_map_interface.html and it will let you download a comma-separated value file (.csv) that can be opened by Excel. Holler if you get stuck. Dale Kaiser Environmental Sciences Division Oak Ridge National Laboratory (865) 241-4849

Q I downloaded (and would now like to publish data from) an Excel worksheet with the title CO₂ emissions from fossil fuels and cement in MtC/yr (TgC/yr) CDIAC data to 2006, extended to 2007 and 2008 with BP data Gregg Marland and Tom Boden-CDIAC- October, 2009. It included per capita global CO₂ emissions numbers for 2007 and 2008 (1.29 and 1.3 tons/cap/yr). Now I'm unable to find this on your Website, and thus unable to publish a usable citation. Can you tell me where it is located publicly? Thanks Bob Engelman VP for Programs Worldwatch Institute (7/16/10)

A Bob: CITE AS: Boden, T.A., G. Marland, and R.J. Andres 2009. Global, Regional, and National Fossil-Fuel CO₂ Emissions Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001. I think the preliminary estimates you seek are available at: http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls Global data through 2006 are at: http://cdiac.ornl.gov/trends/emis/overview_2006.html Data for individual countries are now available through 2007: http://cdiac.ornl.gov/trends/emis/tre_coun.html Let me know if there is anything you still lack. TJ Blasing

[Robert replies] T.J. Thanks for your quick response. I don't think that's the same worksheet, however. I'm attaching what I have. I must have downloaded it from CDIAC's website just a few weeks or so ago, but I stupidly failed to note the URL and I've been unable to relocate it since. I appreciate your help. Bob Robert Engelman Vice President for Programs Worldwatch Institute +1 202 452 1992 extension 539 1776 Massachusetts Ave, NW Suite 800 Washington DC 20036 USA

[Gregg Marland weighs in] Bob, the spreadsheet you have has never been publicly accessible on our web site. It is one that I put together as a summary of data on our web site in response to a specific request from someone. It was subsequently shared with a couple of others, including some news outlets. The citation that TJ has provided leads to exactly the same data but not in the focused format. As he noted, we now have data through 2007 with a BP related extension to 2008 and 2009. The data through 2007 were posted on our web site very recently and the 2008-2009 extension has been completed but is not yet posted. I have not yet had an opportunity to update the spreadsheet that you have and I suspect that for many purposes it is quite adequate to cite the year old spreadsheet. You could cite it as he suggests for the data or just call it a personal communication from Boden and Marland. Or I can help you update it to 2009. Note that I am traveling and do not have access to my files until 26 July. Gregg

[Robert replies] Thanks much, Gregg. I can't resist the opportunity to pull the data forward to 2009 if that's possible. Then I could use both T.J.'s recommended citation and a personal communication from you. I'll be in town from 26-29 July and then traveling myself. If there's any possibility you could provide the 2009 data in that window, it would be great. I'll make a note to myself to get back in touch with you at that time. Best, Bob Robert Engelman Vice President for Programs Worldwatch Institute +1 202 452 1992 extension 539 1776 Massachusetts Ave, NW Suite 800 Washington DC 20036 USA

Q On the EIA website they have a graph of atmospheric concentration and anthropogenic emissions of carbon dioxide which is referenced as yours but I cannot find the original on your site. It very neatly shows the parallel increase. A link would be great! Thank you for your assistance in this matter, Regards, Helena <http://www.eia.doe.gov/oiaf/1605/ggcebro/chapter1.html> (7/15/10)

A Helena: See if you can find what you want from the list on this page: http://cdiac.ornl.gov/by_new/bysubject.html#trace If you need any further help, let me know and I may be able to get you closer to your specific needs. TJ Blasing

Q Thank you for providing the estimates for CO₂ emissions; this is a very useful service. My question is regarding the negative numbers for "Total CO₂ emissions from fossil fuels (thousand metric tons of C)". For example, YEMEN 1990-818 or SENEGAL 1968-22. How could this number be negative or calculated to be negative? Thanks Mehdi Akhlaghi DEC Development Data Group (office) 202 473 3841 (email) makhlagh@worldbank.org (7/12/10)

A Negative emissions are of course not possible but negative numbers do provide some information on the uncertainty of emissions estimates. Basically we estimate emissions from data on energy consumption. Consumption is estimated as the sum of production and imports less the sum of exports and changes in stocks. So if a country has large production and large exports with some error in both, the difference between 2 large but uncertain values can be a negative number. This does not happen often, but as you have discovered it does occur occasionally. Let me know if this is not clear or if it does not make sense to you. Gregg

[Mehdi response] Dear Gregg, Thank you very much for the explanation. I think for our purposes, for the few observations with negative values, we treat the negative numbers with a footnote indicating their uncertainty. Thanks again. Mehdi Mehdi Akhlaghi DEC Development Data Group (office) 202 473 3841 (email) makhlagh@worldbank.org

Q Dear TJ, Could you share with me a copy of our state/year per-capita CO₂ data? I will cite you as the source of the data. Please let me know what research papers you would like me to cite. Thanks very much, matt kahn (7/10/10)

A You can find our data at: http://cdiac.ornl.gov/ftp/trends/emis_mon/stateemis/percapbystate.csv Please Cite as: Blasing T.J., C.T. Broniak, and G. Marland, 2004. Estimates of Annual Fossil-Fuel CO₂ Emitted for Each State in the U.S.A. and the District of Columbia for Each Year from 1960 through 2001. Carbon Dioxide Information Analysis Center, Oak Ridge National

Laboratory U.S. Department of Energy, Oak Ridge, TN, U.S.A. doi 10.3334/CDIAC/00003 Relevant Publication is attached We go all the way back to 1960, but only out to 2001; EPA has now taken over that function for years since 2001; however their data only go back to 1990.

[T] attached PDF: MITI PAPER.pdf

Q Are you able to estimate how many metric tons of carbon dioxide emissions were produced by air-conditioning homes, workplaces and malls in the United States in a recent year? (7/9/10)

A Audrey: All I can say for now is that we are working on some of these questions. You might want to read our paper (attached) which provides the seasonal cycle of USA carbon emissions. See Figure 2. TJ Blasing

Q please convert 2270g of emitted CO₂ to ppm. show the procedure/workings (7/8/10)

A CO₂ ppm to mass (Pg) conversion: Mass of Atmosphere (Handbook of Chemistry and Physics 514000 Pg <http://www.agu.org/pubs/crossref/1994/94JD02043.shtml>) Air is a mixture of gases with an average molecular weight of about 29; the molecular weight of a CO₂ molecule is about 44. $44/29 = \text{Conv factor } 1.517$ Mass of 1 ppm CO₂ times mass of atmosphere = $514000 \times 1.517 \times 1/1000000 = \text{CO}_2 \text{ Mass in Pg/PPM} = 7.798$ For carbon only, $7.798/3.67 = \text{C mass in Pg/ppm } 2.125$ Which is an approximation for the troposphere plus stratosphere which is about 99% of the atmosphere by mass. If you want to account for that 0.99 you can multiply by 0.99. TJ Blasing

Q Graphs of global total carbon (dioxide) emissions (measured in GtC/year) since 1750 often say "from fossil fuel burning, cement manufacture and gas flaring". It is unclear to me how and whether the carbon in non-fossil fuel methane (e.g. rice fields) is included in these graphs. Can you recommend some literature on this subject? I am a paleontologist by training but will teach a course on global warming in the fall. Thanks! (7/8/10)

A Alexander: The estimates on our web site really are just CO₂ (measured as the mass of carbon) from fossil fuels and the calcining of limestone to make cement. To get data on other greenhouse gas emissions, my initial suggestion is to go to the web site of the World Resources Institute and look at their CAIT tool. They have trouble finding the full data sets and the file is not up to the most recent years, but it is the best that I know of. For individual countries (including the US) there are other good choices, but looking globally is tough. For the US, the EPA has an annual report that does a pretty good job of delineating emissions of everything in a clear and comprehensive way (report name = inventory of greenhouse gas emissions and sinks). Cheers, Gregg Marland

Q How much CO₂ is generated by burning coal to obtain one kWh. (7/7/10)

A Fred: The answer depends on the rank of the coal; 0.97 kg-CO₂ is a good number for the US average; if you'd like I may be able to find a more precise figure for New York only. This is CO₂ per kWh generated; parasitic power and line loss are not accounted for so it does not apply to CO₂ delivered. TJ Blasing

Q This is Yu Hui, a Statistic Officer from the National Environment Agency, Singapore. We are currently undergoing a data collection on the amount of Greenhouse gases emission in the European cities for the year between 2008 - 2009. We will like to ask if you could assist us in providing us the relevant information on the Greenhouse gases. Kindly let us know if there are any issues. I can be contacted through yeong_yu_hui@nea.gov.sg. I appreciate the time in reading this email. Thanks (7/6/10)

A Our estimates of CO₂ emissions are only at the level of countries; we do not make estimates at the level of cities. We are just about to complete our estimates for countries for 2008 and 2009. If country estimates would be useful to you we should be able to send them within the next day or two. Best wishes, Gregg Marland

Q Hi, Can you tell me how much CO₂ is locked up in rocks at this time? It seems to me all the CO₂ now a part of huge rock formations was in the atmosphere at some time in the distant past (~4 bya or so) and at that time no life could have existed due to all that CO₂. So, can you tell me what percentage of atmospheric CO₂ would kill off life? Are some forms of life able to live in CO₂ gas? thanks jim (7/5/10)

A Sundquist E. T., 1993, The global carbon dioxide budget. *Science*, v. 259, p. 934-941. One person who has written well on this topic is Eric Sundquist at the US Geological Survey. Being from a Laboratory you probably have access to SCIENCE magazine and I think the article cited above should provide much of what you want to know. You will note that CO₂ does not exist in rocks, rather the carbon in rocks generally occurs either as a carbonate (for example CaCO₃) or as hydrocarbons (as in oil). In either case it was CO₂ in the atmosphere and the amount in sedimentary rocks is, as you note, very large. Our best, Gregg Marland

Q | how do i calculatethe amount of CO₂ that will be emmitedfrom 1000 litres of fuel, kerosine, and diesel, putting the answer in ppm (7/4/10)

A | Ofomola First, find the heat content of each fuel. Multiply the amount of fuel by the heat content to get the energy value typically in megajoules but terajoules (TJ) are frequently used for larger amounts. Next, multiply the heat content by the carbon coefficient or emissions factor as it is often called. I can send along values for the USA if you'd like, but IPCC values are more typically used worldwide. IPCC default emissions factors are found at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf Note these are in kg-CO₂/TJ; carbon cycle modelers often track only the carbon atoms to get from CO₂ to carbon only, divide by 3.67. Finally, divide carbon (only, not CO₂) emissions in petagrams by 2.12 to get ppm added to the troposphere and stratosphere. Typically, about half the emitted fossil carbon stays in the atmosphere and the rest moves into the oceans or terrestrial biosphere. TJ Blasing

Q | I don't know if the estimations of the Global CO₂ Emissions from Fossil Fuel Burning, Cement Manufacture, and Gas Flaring 1751-2007 are production based or consumption based. I couldn't read it out of the method description. So did you allocate those CO₂ emissions to one country that had been produced or consumed in this country? Maybe you can help me. Thanks in advance (7/2/10)

A | This is a physical inventory of emissions. Emissions are summed where they physically occur. If electricity is produced in Austria and consumed in Hungary, the fuel is burned in Austria and the emissions are in Austria. Gregg

Q | I am currently using the CO₂ statistics available from your website. I will like to know what the following represent: 1. Liquid fuel 2. Gas fuel 3. Solid fuel. Many thanks (6/29/10)

A | Basically, solid fuel is coal but it includes lignite and peat. Gas fuel is natural gas. Liquid fuel is all liquid petroleum products plus natural gas liquids. When imports and exports are considered, solids include coke, gases include coke oven gas and LPG. Biological fuels (wood, ethanol, etc.) are not included. Uranium is not included.

Q | I am looking for PROJECTED CO₂ emissions (not per capita) BY COUNTRY. Any help would be appreciated (6/24/10)

A | I suspect you are familiar with the SRES scenarios from the IPCC. They are by region rather than by country and are now a bit dated, but they are what most people are still using. I am not able to suggest a better alternative. Gregg

Q | What is a carbon footprint per pound of truck delivered goods? Thank you. (6/24/10)

A | Irena, The pound portion of your question is actually a very small part of the overall answer. Much more of the answer depends on the size of the truck, the truck aerodynamic shape, the type of engine, the fuel used in that engine, and the distance traveled by the goods. Typical values are on the order of 550 to 850 grams CO₂ per mile. You would then need to divide that rate by the mass of goods you are carrying to get mass CO₂/mile/pound of goods. I hope this was of use. Sincerely, Robert Andres

[more from Bob] Irena, There was a typo in my previous response to you. The pound portion of your question is actually a very small part of the overall answer. Much more of the answer depends on the size of the truck, the truck aerodynamic shape, the type of engine, the fuel used in that engine, and the distance traveled by the goods. Typical values are on the order of 550 to 850 grams CO₂ per mile. You would then need to divide that rate by the mass of goods you are carrying to get mass CO₂/mile/pound of goods. I hope this was of use. Sincerely, Robert Andres

Q | Hello, I am Jessie from Taiwan. In this summer, some of the university students in Taiwan and China will cooperate to hold a forum on "Energy". In the forum, I have to write a small essay and I search for many books and websites. Many of the reports say that fossil fuel plays a very important role to CO₂ emission, and I would like to consult for the data or how many percent is the emission of fossil fuel in the total CO₂ emission. If you have any relevant information, please let me know. I have searched for the website already, but I did not see the percentage, I find the fossil fuel CO₂ emission only. (6/23/10)

A | On our web site you will find fossil fuel CO₂ emissions for all countries and for the world as a total. If you want to find the data for all human-caused emissions of CO₂ (and other greenhouse gases) you might want to go to the web site of the World Resources Institute and look at their CAIT data set. It is not quite as up-to-date as our web site, but I think it is the best site to find data on all greenhouse gases. You might also find some useful numbers in the first chapter of the attached report. Gregg

[Gregg attached "National Research Council 2010.pdf"]

Q | What percentage of global warming is the result of change in the earth's orbit, and what percent is due to all other greenhouse gases. (6/18/10)

A | Dear James Russell, We appreciate your question to the CDIAC Web site. We can safely say that the observed warming over the last 100 to 150 years is not driven at all by orbital factors. These act on much longer time scales - typically tens of thousands of

years. For starters Google "Milankovitchcycles". Most climate scientists agree from their intense research of recent decades that the vast majority of the warming experienced in the last 100 to 150 years is due to anthropogenic emission of greenhouse gases - mainly carbon dioxide. The best place to see the expert summary of this is through the IPCC at: <http://www.ipcc-wg1.unibe.ch/publication/wg1-ar4/wg1-ar4.html> Start with the technical summary and the FAQs. Other main chapters related to understanding the warming are 1, 2, 3, and 9. Sincerely Dale Kaiser CDIAC

Q Hello- Searching your web site, I have been unable to find a CDIAC document for which I have a citation that I believe is valid: Marland, G. et al 2006 Global CO₂ emissions from fossil-fuel burning, cement manufacture, and gas flaring, 1751-2003. Would it be possible for you to help me locate a PDF of this document? Thanks very much. Sincerely, Peter Montague, Ph.D. (6/14/10)

A Hi Peter, Basically the citation you have below is just the earlier reference to CDIAC's dynamically updated inventory of CO₂ emissions. The current version is here: http://cdiac.ornl.gov/trends/emis/overview_2006.html and as you'll see is a bit different. Gregg Marland wanted me to point out to you that if one for any reason needed the older data, they still do exist. Of course they would be considered not as good as updated records that may possibly have some of the earlier years tweaked a bit - not sure how much that happens. Regards, Dale Kaiser CDIAC

Q Dear Sir, I am in the process of comparing model outputs of global mean annual temperatures for the period 1959-2000 with the record from observations HadCRU, NOAA. I have compared the observations with the annual figure for CO₂ (Mauna Loa). How should I acknowledge the CO₂ figures in submitting for publication? (6/12/10)

A Philip Thanks for checking and for your attention to citing properly. CITE AS: Keeling R.F., S.C. Piper, A.F. Bollenbacher and J.S. Walker. 2009. Atmospheric CO₂ records from sites in the SIO air sampling network. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi: 10.3334/CDIAC/atg.035 TJ Blasing

Q I am looking for proxy CO₂ data of the best possible time resolution going back to 4000 years before present. I've looked over the Vostok and Law Dome ice core data, finding the Law Dome data of good time resolution but going back to only 1000 ybp, and, the Vostok ice core CO₂ data that I've been looking at has much lower time resolution (only 3 data points in the 4000 year period I'm interested in). Is there an existing data set of proxy CO₂ data that goes back to 4000 ybp but with higher time resolution than the Vostok core? (6/7/10)

A Hi Ben, Afraid not. Vostok and Law Dome are the best we can offer for ice core records. You may have to resort to other proxy records (e.g., lake sediments) to reconstruct atmospheric CO₂ levels 4000 ybp. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am seeking 1. the total world CO₂ E emissions emitted by human activity in megatonnes in 2005; 2. the reduction from the world total 2005 level human-caused CO₂ E emissions in megatonnes required to stabilize warming of the atmosphere and prevent dangerous climate change. please indicate your sources. thanks (6/7/10)

A Hi David, Please note the URLs below. If you have additional questions or need further assistance, please e-mail me directly. Regards, Tom Boden Carbon Dioxide Information Analysis Center (CDIAC) Oak Ridge National Laboratory. On Monday 07 June 2010 14:42, you wrote: > The following question was submitted through the CDIAC Web site > feedback > form: > > Date: 6/7/2010 > Name: David Thorne > Organization: ACOA > Telephone: 613-954-3307 > Email: dthorne@acoa-apeca.gc.ca > Subject: Other > ----- > > Question > I am seeking > > 1. the total world CO₂ E emissions emitted by human activity in > megatonnes in 2005; Fossil-fuel use http://cdiac.ornl.gov/trends/emis/tre_glob.html Land-use changes <http://cdiac.ornl.gov/trends/landuse/houghton/houghton.html> > > 2. the reduction from the world total 2005 level human-caused CO₂ E > emissions in megatonnes required to stabilize warming of the > atmosphere and prevent dangerous climate change http://www.ipcc.ch/publications_and_data/ar4/wg3/en/tssts-ts-3-2-stabilization-scenarios.html > > please indicate your sources. thanks

[David replies] Hi Thomas Thank you very much for the references. In looking at the number for the world emissions for 2005 it does not seem to jive relative to numbers for individual countries. For example the top emitting countries with their emissions in megatonnes are as follows: 1. China 7,234 2. USA 6,931 3. EU 5,049 4. Russia 1,947 5. India 1,866. But according to your chart the total world emissions 2005 is 7,971,000 megatonnes (7,971 million tonnes)? But perhaps I am misinterpreting the measure?

[and Tom replies] Hi David, I am confused by where your numbers came from because China only became the world's largest emitting nation in 2006, not 2005. It also appears the global estimates are in units of carbon while the national estimates appear to be in units of CO₂. It is true that the sum of countries does not equal the global total but the differences are typically 3-5% annually. Our global estimates are based on energy production data which are deemed more reliable than energy consumption data. Our national estimates are based on production and trade data (imports, exports) in order to calculate "net apparent consumption". Our global estimates include emissions from bunker fuels (i.e., ships and aircraft used in international trade) while our national estimates do not. Our global estimates also include emissions from fuels used for non-energy purposes (e.g., asphalt) while our national estimates do not. We are in the process of posting our latest emission estimates (i.e., the 2007 estimates). The global time series is provided at http://cdiac.ornl.gov/trends/emis/tre_glob.html while the 2007 national estimates may be seen at <http://>

cdiac.ornl.gov/trends/emis/top2007.tot The 2007 global estimate is 8365 million metric tons of carbon. The top 5 fossil fuel CO₂ emitting nations in the same units, in 2007 are China 1783 USA 1592 India 440 Russia 419 Japan 342 ----- 4576 I hope this helps
Regards Tom Boden

Q Are the (H)(C)FC concentrations on http://cdiac.ornl.gov/pns/current_ghg.html really 10/6-9/7 averages as note 2 says, though it's called "current" & the top says "updated 12/9"? (6/4/10)

A William: These data were posted in December of 2009 and mostly represent values through March 2009. We expect to update these in a month or so; we update pretty much simultaneously with AGAGE, which is the source of much of our data on the chemical species of interest to you. TJ Blasing

Q How big is influence of H₂O, clouds and water vapour on greenhouse effect and global warming in comparison with CO₂? (6/3/10)

A Dear Krzysztof: We appreciate your question to the CDIA Web site. Water vapor is the single most important greenhouse gas. H₂O and clouds are very important to climate and, in fact, there are entire climate programs (e.g., Atmospheric Radiation Measurement) dedicated to a better understanding of clouds in order to improve modeling efforts. Water vapor is controlled mostly by natural processes including evaporation, condensation, and transpiration. Carbon dioxide has both natural and human sources but it is these human sources, mostly fossil fuel combustion, that accounts for the rise in CO₂. CO₂ is also the most abundant of the greenhouse gases (i.e., ~385 ppm in the troposphere). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear Madam, Sir, I am interested in the following fossil fuel CO₂ emissions series at the national level: http://cdiac.ornl.gov/trends/emis/tre_coun.html I have seen research papers using series ending in 2008. However, I find only data ending in 2006 on your website. Could you tell me if national series ending in 2008 are available? If not, do you plan to update the series soon? Many thanks in advance for your answer and kind regards, Carlos ETH Zurich, Switzerland (5/27/10)

A Here are some preliminary but citeable and fairly good, numbers through 2008. http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls TJ Blasing

Q How many tons of CO₂ does the Iceland volcano emit / day versus other producers? (5/26/10)

A Bill, I used to work on volcanic emissions but have not done so for many years now. However, I still keep up on volcanic emission studies/news. CO₂ is not a gas routinely measured at volcanoes because of a lack of suitable instrumentation. I am aware of no CO₂ measurements at the current eruption in Iceland. A recent study by Morner and Etiope (2002, Global and Planetary Change, pp. 185-203) estimated volcanic fluxes to the atmosphere as 300 million tonnes C per year. To put that into perspective, the CO₂ emitted from fossil fuel consumption (and cement production) in calendar year 2006 was 8230 million tonnes C (http://cdiac.ornl.gov/ftp/ndp030/global.1751_2006.ems). The fossil fuel CO₂ flux is about 27 times more than the estimated volcanic CO₂ flux. I hope this is of use. Sincerely, Robert Andres

Q How much CO₂ is produced (in kilograms preferably) due to burning of 1 kilogram of fuel wood? (5/20/10)

A The carbon content of wood varies a bit with the kind of wood and the moisture content of the wood. But, for dry wood, the carbon content of wood is roughly 50% by weight. So 1 kg of wood contains about 0.5 kg of carbon, which will combine with oxygen to yield $(0.5) \times (44/12) = 1.83$ kg of CO₂. Best wishes, Gregg

Q We have developed a proprietary process that scrubs emissions from industrial and coal fired flue gas. The process produces by products that have such a value that it more than pays for itself. We are looking to do some large scale testing up to 1,000 lbs. We would need to heat our medium up to 800C. The Texas Center for Superconductivity at UoFH has done the initial experimenting testing and verification, but in small quantities. Is testing of new processes something that your lab can do? If so, I would look forward to discussing the process further. (5/19/10)

A Ian, this is way outside of the scope of what we do at this research facility. There must be commercial facilities that do this sort of thing but I am not familiar with the possibilities. We wish you luck in developing the process and finding markets for the products. Cheers, Gregg

Q Dear CDIAC, I am writing a paper about Ocean acidification in the east coast of the United States, and is thinking to compare our data to the west coast. Do you happen to have the west coast carbon cycle (any two parameters of DIC, Alk, pCO₂ or pH) data? Thank you, Liqing (5/19/10)

A Dear Liqing Jiang, We appreciate your question to the CDIAC website. Please visit our coastal ocean website for the data you seek at http://cdiac.ornl.gov/oceans/Coastal/Coastal_data.html. Good luck with your paper! Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Respected sir, myself Santanu mukherjee, an aspirant from INDIA wish to do my research work on soil-carbon sequestration sir, please inform me what is the impact of study of soil-carbon sequestration in INDIAN perspective if any please reply & help me, please be in touch your's faithfully Santanu mukherjee (5/18/10)

A Dear Santanu, Thank you for your question to the CDIAC website. I direct your attention to the following URL for some sense of the importance of terrestrial carbon management. Given India's dependence on coal, growing population and large land area, soil carbon management is very important. <http://cdiac.ornl.gov/carbonmanagement/>. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Do you have a data set depicting the Observed average global surface temperature deviation from 1855 - present? (5/5/10)

A Thank you for your request to the Carbon Dioxide Information Analysis Center. Yes, we do have long-term global temperature departures dating back to 1855. The time series may be found at <http://cdiac.ornl.gov/trends/temp/hansen/data.html>. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I would like to ask the precision of the data. In the "Fossil-Fuel CO₂ Emissions by Nation", I download the file "All countries (one file - comma delimited)". I would like to ask whether you have more precise estimation of per capita emission rate (i.e. corrected to 0.001). I know the data is per capita emission rate of carbon. I would like to know whether you have the data of per capita emission rate of carbon dioxide, correct to 0.01 (4/28/10)

A You can certainly calculate per capita numbers to .001, but the numbers would be meaningless; the numbers used for both emissions and for population are just not known with sufficient accuracy to justify this. In fact, I would say that with numbers to .01 you should question whether the last digit is significant. Cheers, Gregg

Q Hello, I am contacting you with a question for just my own curiosity. There have been many debates on climate these past few months and I've been doing my research because I really want to know the truth. I was curious if one of you might be willing to take the time to give me a lesson on how one can get an accurate reading on what the temperature was during a specific period in time. I know one method is to analyze trapped air bubbles in ice cores. What in the air bubble tells you temperature? (I would assume that the bubble's actual temperature is affected by the ice encasing it, or is it simply a measure of how many molecules make up that space, density of air?) I am really curious how you guys derive that reading? Is this the only method to get average global temperature readings from years pre-dating recorded measurements? How do you actually date the samples, how accurate is the method? I understand that my lack of a formal science education leads me to some of these questions. But I will hope that my quest to solve my ignorance will be seen as a welcoming plea, versus a burden. But, if I don't get a response I understand that you guys have important business to be tending to. But hey, the more of the average people in the world understand the importance of your work, I'm sure the more it helps support your cause. I work on for the military, thus I am in desperate need of extremely solid information. Odds are against me here when arguing for climate change! Thank you very much for your time! Jonathan Adams (4/28/10)

A Dear Jonathan Adams, We appreciate your question to the CDIAC Web site. And no worries, your questions are not a "burden". Addressing good questions is part of our job! What allows for the estimate of pre-historical temperatures from ice cores is a chemical analysis of the trapped gas bubbles in the ice; more specifically the ratios of certain isotopes. These ratios are temperature dependent. Please see the Methods sections in the following two summaries of ice core data records held at CDIAC: http://cdiac.ornl.gov/trends/temp/vostok/jouz_tem.htm <http://cdiac.ornl.gov/trends/temp/domeq/domeq.html>. We here are not the scientists who have done this work; we quality assure the data records, looking for internal consistency and such, make plots of the data, work with the investigators to write up documentation and make things available from our DOE-sponsored web site. There are also many other authoritative sites on the web to explain the methodologies. Here is a well-known source: http://www.gisp2.sr.unh.edu/MoreInfo/Ice_Cores_Past.html. Pls. contact us if we can be of further assistance and we thank you for your interest. Sincerely, Dale Kaiser kaiserdp@ornl.gov

Q You state: Q. Should we be concerned with human breathing as a source of CO₂? A. No. While people do exhale carbon dioxide (the rate is approximately 1 kg per day, and it depends strongly on the person's activity level), this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere. Of course, the agriculture, food processing and marketing industries use energy (in many cases based on the combustion of fossil fuels), but their emissions of carbon dioxide are captured in our estimates as emissions from solid, liquid, or gaseous fuels. [RMC] I wonder if

this is correct It would be correct if the half-life of atmospheric CO₂ was small compared to the growth rate of population, but the estimated half-life of CO₂ in the atmosphere is 200 years, and over the last 200 hundred years the world population has been growing fast - in fact it doubled from 1950 to 1990. (ref: <http://www.un.org/esa/population/publication/longrang2/WorldPop2300final.pdf>). What do you think? (4/28/10)

A Elaine, I see that this reply cited below was written by our old, now retired, boss (RMC), and I think it is basically correct. Fundamentally each of us is our own little carbon cycle, eating vegetables or whatever and respiring the carbon back to the atmosphere as CO₂. When you get down to the details, we do affect the global carbon cycle in two interesting ways. Number one, as you note, the total number of people is increasing and we are made up partly of carbon - so the amount of carbon contained in people (as opposed to being in the atmosphere) is increasing over time (we are also getting fatter). It turns out that this is real, but small enough that it does not matter much. For scientists interested in the details of the global carbon cycle, it is also interesting that although we are cycling carbon on a global scale, there are time and space differences. That is, crops are grown at one time and place but eaten and respired at other times and places. So if we really want to know the details of the carbon cycle (and we do), then we study the details about where the crops are grown, how they are transported and where and when they are consumed. Observations of the chemistry of the atmosphere are able to see some of these differences. Cheers, Gregg

Q We are submitting a proposal to DOE TCP to address mechanisms of C flux in arid ecosystems. The solicitation recommends that proposers contact CDIAC in advance to determine your interest in archiving our data should our proposal be successful. If you are interested in potentially archiving our data, would you please provide any documentation on quality assurance/quality control requirements or other data format and metadata requirements? Thank you. (4/26/10)

A Hi Lynn, I am deeply sorry I missed your submission via our web form until now. We'll be happy to archive your data and results should your TCP proposal be successful. Good luck! We can talk directly once funded but in the meantime I direct you towards guidance we provide to AmeriFlux investigators in terms of data submission guidance, QA/QC protocols, suggested standard operating procedures, etc. <http://public.ornl.gov/ameriflux/data-guidelines.html> <http://public.ornl.gov/ameriflux/sop.shtml> Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q Dear CDIAC, I have used the meteorology monthly data available at http://cdiac.ornl.gov/ftp/ushcn_v2_monthly/ and the meteorology daily data available at http://cdiac.ornl.gov/ftp/ushcn_daily/. I'd like to know if the monthly data are derived by daily data. If it is true I have found some incongruity between monthly data and elaboration of daily data. For example I have calculated monthly rainfall depth for a station (without error or flag) starting from daily data and this value is not equal to the monthly value of the same station, same year, same month. How is it possible? Then I'd like to know how is the meaning of s-flag in the daily data sheet. I can't find the meaning in the read-me file. I have observed that in the data-sheet, s-flag is BLANK when the value is -99999 otherwise it is always equal to "6". What does this mean? I hope that you can help me as soon as possible. Gustavo Marini (4/25/10)

A Dear Gustavo Marini, We appreciate your question to the CDIAC Web site. Yes, the monthly HCN data are indeed derived from the daily data, but due to quality control efforts and a complex set of adjustments made to the data, often times the sum of the daily obs. will not be the same as the monthly total. A lot of the adjustments involve "nearest neighbor" checks. To get an idea of the monthly procedures, please see: http://cdiac.ornl.gov/epubs/ndp/ushcn/monthly_doc.html. With regard to the daily data, these values are quality assured and sometimes edited when a problem can be readily deciphered or at least flagged (as you have observed), but have not been adjusted with an algorithm like the monthly data. With regard to the "s" and "6" flags, please see the documentation here: http://cdiac.ornl.gov/epubs/ndp/ushcn/daily_doc.html. If you have further questions, please give me specific records or examples to examine and I will be glad to help further. Sincerely, Dale Kaiser CDIAC kaiserdp@ornl.gov

Q How much of CO₂ emissions/kg is made by burning of High Speed diesel/liter, Pet Coke/Kg, Wood/Kg, Biomass/ Kg And Husk Briquette/kg (4/25/10)

A Wood and biomass depend on moisture content. You might find the material near the bottom of the following table useful: http://bioenergy.ornl.gov/papers/misc/energy_conv.html. Finally, of course, one needs to know the amount of carbon dioxide per unit of energy produced to make fair comparisons among fuels in those units. TJ Blasing

Q Is there any numerical data on CO₂ emissions due to land use changes before 1850? Even wild estimates would help. I want to extend Houghton's record as far back as I can. Thank you. Rob E (4/24/10)

A Rob, CDIAC does not archive or distribute the data you are requesting. You might have more success contacting Dr. Houghton directly. (houghton@whrc.org) Good luck, and thank you for your request. Sincerely, Lisa Olsen CDIAC

Q 1 liter of water equals to how many kg of CO₂? (I want to calculate the linkage between water saving and CO₂ calculation) (4/23/10)

A Dear Sharon, I apologize your inquiry was not answered more promptly. The delay was due, in part, to the fact I was not sure how to answer your question. I suspect you want to know energy costs to provide water. If so, that would be heavily dependent on the technology being used, water source, and distribution system. I have no conversion factors for that information. Sorry I

could not be of more help. Sincerely, Robert Andres

[Sharona replies...] Dear Robert, I appreciate your feedback about my question, even its not the answer! :) I'm working on an eco-toilet project in China, which means the toilet don't need to flush with water, which save a lot of water while maintaining hygiene and sanitation. I'm trying to figure out the most general calculation of the link between water consumption and the emission of CO₂, so I would build the link between water saving by the eco-toilet and CO₂ emission. Is there any conversion factors in place if the water is being processed in the big city? Thank you! Sharona

[Bob replies...] Sharona, The conversion factor you are looking for is the energy used to provide water, transport water to the house, remove waste from the house, and wastewater processing. Each of those four steps has many possibilities on how energy efficient the water is processed. I do not know those statistics for China. If you are working in a specific city in China, you could try asking the relevant authorities there. Sincerely, Robert Andres

Q Hello, I am trying to make use of your "New IPCC Tier-1 Global Biomass Carbon Map for the Year 2000" data but am unable to load the data using ArcGIS, ERDAS, or IDRISI. Is there someone I may contact for assistance to simply get the data to display? Thank you for your time, Ben (4/23/10)

A Hello Ben, Which files are you having difficulty with? This dataset is composed of several shapefiles, grids, and text files. It would be helpful if you could share some additional information on specific files, software used, and errors encountered. Thanks, Lisa Olsen CDIAC

[Ben replies] Hello Lisa, Thank you very much for the reply. The problem seems to have been corruption resulting from the download somehow, as re-downloading has now resolved the issue. I had tried opening the data on multiple machines, which always resulted in shutdown of the program used, generally without an error message. However, it would be very helpful if you could tell me if you have country/administrative boundary data that coincides with the continental boundaries used in the "New IPCC Tier-1 Global Biomass Carbon Map for the Year 2000" dataset, or if you could recommend a best fit. Thank you very much for your time, Ben

[Lisa replies] Hello Ben, Since the ecoregion zones used to create this dataset came from FAO, I'd suggest reviewing their boundaries first. They have several levels of administrative boundaries available. I've included the URL for FAO's GIS data gateway: <http://www.fao.org/geonetwork/srv/en/main.home>. Please let me know if you have any further questions. Sincerely, Lisa Olsen CDIAC

Q May I know what is the allowable concentrations for CO₂ exposure, or UNEP health standards for CO₂. Many thanks for letting me know. (4/22/10)

A http://www.osha.gov/pls/oshaweb/owadisshow_document?p_table=STANDARD&p_id=9992 Tables like this one give the limits for CO₂ in air as prescribed by the US Occupational Safety and Health Administration (OSHA). You should be able to get more details by searching their web site. Cheers, Gregg

Q Dear CDIAC Team, I'm working with Greenbang founder Dan Ilett and editor Shirley Gregory to assemble a panel of industry experts who can offer occasional insights and opinions on cleantech and the green-energy economy for our readers and clients. I would like to ask for an appropriate expert or official in your company who might be interested in participating in occasional email or phone surveys and/or possible periodic events to contribute thoughts as a part of our panel. At the moment, we have no set schedule or requirements— we're just looking for thought leaders who can provide some opinions and ideas from time to time. Is there someone at your organisation who might be interested in being part of our panel and, if so, what is the best way to get in touch with him or her? If you have any questions or need clarification on anything, please let me know. Thanks very much, Amelia Generalao (4/20/10)

A Dear Amelia, I suggest Mark Downing (downingm@ornl.gov) or Brian Davison (davisonbh@ornl.gov). <http://www.esd.ornl.gov/people/downing/index.shtml> <http://www.ornl.gov/sci/besd/davison.shtml> Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q is there a difference between fossil CO₂ and not fossil CO₂ in terms of the time they take to be reabsorbed in the nature? (4/17/10)

A Once in the atmosphere all CO₂ behaves identically. Cheers, Gregg

Q How do I go about obtaining permission to reuse a figure from your company? (4/16/10)

A Dear JaNeise, You are welcome to use any of the figures from our website. Our only request is that you acknowledge the original data source and, if possible, CDIAC too. Thanks, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge

Q Hi, Can you please tell me for how long you have records of CO₂ amounts? do you go back before the Industrial Revolution? Does anywhere else in the world hold a longer period of data? If so, do you have a contact for them and do you know how far back they go? Thanks Phil P. (4/16/10)

A Our estimates of CO₂ emissions from fossil fuel combustion start in 1751 and no one has estimates that go back further. Cheers Gregg

[from Tom Boden] Dear Philip It was not clear from your question to our website whether you were referring to CO₂ amounts emitted or levels in the atmosphere I'll provide pointers to both. Our longest atmospheric CO₂ record dates back 400,000 years and is derived from the Vostok ice core. This record may be found at <http://cdiac.ornl.gov/trends/CO2/vostok.html> The best ice core record covering the pre-Industrial Revolution period is from Law Dome, Antarctica This record may be found at <http://cdiac.ornl.gov/trends/CO2/lawdome.html> For records of releases of carbon to the atmosphere from fossil fuel combustion and cement production http://cdiac.ornl.gov/trends/emis/overview_2006.html I hope this helps you find what you are looking for. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q What happens if a person on dialysis has a high level of carbon dioxide? Her level is about 35 MEQ/L. (4/15/10)

A The Carbon Dioxide Information and Analysis Center is largely concerned with CO₂ in the context of global climate systems and has no insight on the kind of question you pose. Sorry! Our best, Gregg Marland

Q dear sir/miss, i am a student of the ocean university of china and glad to write to you. i am searching for the method to calculate the amount of carbon emission of the main industries and the main products now, but i haven't found the right way. we have an urgent need of these data so i want to ask you whether you have the appropriate way to calculate. thank you very much! best wishes yours vivian (4/13/10)

A Dear Vivian, We calculate fossil fuel CO₂ emissions for individual countries. Our methods are described in general terms at http://cdiac.ornl.gov/trends/emis/overview_2006.html and in more detail in Marland and Rotty (1984). The resulting national emission estimates are provided at http://cdiac.ornl.gov/trends/emis/tr_e_coun.html The IPCC methodology is described at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html> Best wishes, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am interested in research on rates of respiration and photosynthesis in plants with increased global temperature. I recall reading an article several years ago that indicated that global temperatures have increased more at night than during the day, which has increased the rate of respiration in plants at night and an overall loss of "photosynthate" in plants. Thanks (4/11/10)

A Hi Vicki, A fair amount of literature has been published in recent years on plant activity as a function of increased temperature. If you are interested in actual detailed measurements of both, I suggest you identify AmeriFlux sites providing these data using our AmeriFlux data interface at <http://ameriflux.ornl.gov/> I also recommend using the AmeriFlux/FLUXNET publications search interface at <http://www.fluxnet.ornl.gov/fluxnet/Bibmain.cfm> to identify publications of interest. For example, in the title keywords box I received numerous relevant publication listings when I typed "photosynthesis" or "respiration". Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q Dear Sir, I would like to know if the organization welcomes other ways of converting CO₂ into O₂ especially from private sources who do not abode in the United States of America, if so how will such people gain the opportunity to participate in the development of such new technologies? (4/10/10)

A We are the Carbon Dioxide Information Analysis Center. We are supported by the US Department of Energy but we strive very hard to make sure that our analyses and our data products are available to users around the world and free of charge. We think it is important that all interested people have access to important information on the global carbon cycle and global change. Best wishes, Gregg Marland

[Tom Boden replied] Dear Theophilus Asiedu Sagoe, We are not a funding agency or an instrumentation/technology development group. We are a data center tasked with making climate change information and data freely available to anyone worldwide. If you have information you would like to share regarding any new separation/mitigation technologies, please forward. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q are your databases the ones corrupted by the hockey stick issue? (4/10/10)

A Dear richard cole, We appreciate your question to the CDIA Web site. Our climate databases, be they thermometer records for the last century and a half or so, or proxy temperature data records from ice cores should most correctly be thought of as standing

alone and not mingled with characterizations of the "hockey stick". The hockey stick "issue" is a disagreement mainly about the ability of one particular analysis of paleoclimatic data of many types to correctly characterize temperatures about one thousand years ago, and to a lesser extent the geographical extent of the "Little Ice Age" experienced at least in Europe over mainly the 1600s/1700s. Certainly there is no shortage of online "discussion" about this issue, but we would encourage you to critically evaluate all this info. (especially actual peer-reviewed scientific journal articles) before characterizing the hockey stick as reasonable or unreasonable
Sincerely, Dale Kaiser CDIAC

Q I want to know how can I obtain figure permission for one of your figures (4/9/10)

A Dear JaNeise, You are welcome to reproduce any of our figures. We do ask as a professional courtesy that you acknowledge the original data source. We often provide suggested citations at the bottom of our websites. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q My blood test revealed that my carbon dioxide level is high...it is 203 and it should be according to the report between 100 and 199 what can I do to reduce it and keep it within normal range? (4/8/10)

A Dear Bettye, The Carbon Dioxide Information Analysis Center (CDIAC) at Oak Ridge National Laboratory is the primary climate change data and information analysis center of the U.S. Department of Energy. We have no medical expertise and do not give out medical advice. Please consult with your physician on the implications of your test results. Regards, Fred Baes ORNL

Q Dear colleague I am writing a book and would like to use two graphics from the reports on your website by Keeling et al. displaying time series CO₂ data sampled at Mauna Loa and Baring Head. Can you tell me to whom I should direct my copyright permission request? With best wishes Neil Winterton Department of Chemistry (4/6/10)

A Dear Neil, You have our permission to reproduce the CO₂ graphs from our website or may use the data provided to produce graphics of your own. Our only request is that you credit the original source (Keeling et al.). You might consider using the citation listed on the bottom of many of our CDIAC web pages. Best wishes in writing and publishing your book. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hello, I am doing some research on emissions from the individual sector—from households and non-business travel—in the U.S. I am having trouble finding an annual estimate for these emissions that is more recent than 2000. I have read that these numbers from the CDIAC are available for as late as 2004, but I haven't seen it in your materials. Can you help me? (4/5/10)

A The site that first comes to mind is: http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html But it's not up right now so I can't check to see if it gives the information you want. The first couple of years have pretty good numbers based on recent data; projections out to 2030 get worse as time goes along. Get back to me if this doesn't help. TJ Blasing

[Matthew responds] Thank you, TJ. I am looking around the website and am able to find part of the equation I'm looking for. There is information here for emissions from residential sources, but is there any calculation that pertains to emissions from individual non-business transportation? The number I have from 2000 is 1.86 billion metric tons of CO₂. I'm expecting more recent numbers to be in the same ballpark, but I need to find the reference to back it up. If you could help more, I'd appreciate it. Thanks, Matthew Conrad

[and TJ responds back:] Matthew Tom Boden already answered your question for international data. For just the USA, we can say how much carbon was emitted from aircraft, but we have no way of knowing how many people were on the plane for business pleasure, or both. If I drive to Michigan to visit my daughter, but stop off at Purdue University on the way to attend a meeting, is it a business trip or a pleasure trip? Which is it when I go to the store? The number you gave (1.8 Pg-CO₂) is about equal to the TOTAL to CO₂ from ALL transportation in the USA for the year 2000. This includes 18-wheelers, delivery trucks, transportation for NFL football teams, etc. Generally we have no way of knowing why someone is in a vehicle, except for surveys that the FHWA may be taking. I have sent your question to an expert on these matters. TJ Blasing

Q Dear CDIAC, I came across something in your historical carbon data that I don't understand. For example, how could Australia have had a negative carbon emission from solid fuels between 1851 and 1859? I don't suppose Australia has stored coal back into the ground in those years. Could you explain this please, because Australia is not the only example and I simply cannot imagine what it means. Best regards, Hans Zandvliet (4/1/10)

A Obviously, as you observe, emissions were not negative. But there are several ways that one can get negative values and these help us to understand the uncertainty in the emission estimates. The most common circumstance is for a country that exports a large fraction of its fuel production (for example coal production). So if production is a large number, exports is a large number, and internal consumption is calculated as the difference between production and exports, if there is an uncertainty in both values one can get a negative value as the difference between two large but uncertain values. The result seems a bit bizarre but I hope the logic and significance are clear. I often recommend that people replace the negative values with a zero, but the negative values are

actually statistically interesting Let me know if this is not clear. Gregg

Q What is the % contribution of anthropogenic carbon to the natural carbon cycle (emissions and sinks)? IE Do we know what part of the now 385 ppm in 2008 has resulted from anthropogenic input and change to sinks - assuming that the 280 ppm in 1750 was largely a natural level. Are anthropogenic emissions and change to sinks (land use etc) responsible for the entire 38% increase in CO₂ concentrations between 1750 and 2008? - If not, is there a measure of what concentration is attributed to anthropogenic causes? (3/31/10)

A John, it is not always easy to sort out the natural and anthropogenic phenomenon but my sense is that the change from 280 to 385 ppm can be largely attributed to human impacts on the global system through the primary impacts of fossil fuel use and land surface change and through indirect impacts on things like surface temperature. There are, of course, long term cyclic phenomena that impact global climate as well, but these are generally smaller over this time scale than the anthropogenic impacts. There must be someone who has done a systematic analysis of this but it is not a study with which I am familiar. Searching the fifth assessment report of the Intergovernmental Panel on Climate Change is likely to reveal such a study. Cheers, Gregg

Q 1. What percentage of Carbon Dioxide in the atmosphere has come from man-made sources? 2. What percentage of Greenhouse effect is caused by Carbon Dioxide? 3. Where can I find the reference to this data and other useful data pertaining to Climate Change? (3/31/10)

A Bradley See ** below for answers to your questions I hope this answer was of use to you. Sincerely, Robert Andres
Question 1. What percentage of Carbon Dioxide in the atmosphere has come from man-made sources? ** The atmosphere is a dynamic place. Carbon is constantly flowing into the atmosphere and out of the atmosphere. This carbon is being exchanged with the other major reservoirs of the terrestrial biosphere and the oceans. The fossil fuel reservoir is unique in that the carbon flow is essentially in one direction only, which is from the reservoir to the atmosphere (the rate of fossil fuel creation is negligible compared to the rate of its extraction over the time frames of the last three centuries). So, the answer to your question is dependent upon the exact year and day of that year as the flows of carbon into and out of the atmosphere are highly dependent on short and long term carbon cycling. There is no simple answer to your question. You may be interested in to know how much fossil fuel CO₂ is retained in the atmosphere. This has been studied and while that rate changes over time (depending on how active exchange is with the terrestrial biosphere and the ocean reservoir), over annual time frames about 45% of emitted fossil fuel CO₂ is retained in the atmosphere. This is the primary driver in the increase in atmospheric CO₂ over recent time spans.
2. What percentage of Greenhouse effect is caused by Carbon Dioxide? ** Again, not a simple answer. The greenhouse effect can be subdivided into two components: natural and anthropogenic. The natural component keeps our planet habitable by keeping the majority of the planet in a temperature zone where liquid water exists. The anthropogenic component enhances the natural component by making the planet warmer. Many of the same gases contribute to both the natural and anthropogenic components. The total net anthropogenic component can be quantified by global mean radiative forcings. Figure TS.5 from the URL listed below (http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ts2-5.html) gives 1.6 W/m² as the total net anthropogenic global mean radiative forcing. This is essentially equivalent to that from carbon dioxide alone. However, there are other gases and aerosols that contribute to this global value and these gases and aerosols are linked to the carbon dioxide emissions. The radiative forcing from these other gases and aerosols both warm and cool the planet and the warming and cooling are about equal to each other. Thus the global value (all sources) and the carbon dioxide value are about equal.
3. Where can I find the reference to this data and other useful data pertaining to Climate Change? ** The primary information on climate change is scattered over thousands of documents. The IPCC has collected and summarized this information into a series of reports. The reports can be found online at http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm

Q In the equation of CO₂, where does the free oxygen come from? My understanding is that that oxygen was created 2000 years or more ago and has been kept "topped up" by trees, etc. since then. Isn't oxygen the actual issue underlying the CO₂ concern? And, if our oxygen replenishing systems on Earth are in no present danger, what effect would it have if everyone in India, Pakistan and China were able to own a "People's Car"? Will the trees be able to un-bond all that may occur? Do we really have a never-ending supply of oxygen? Thank You, Cheryl Ramcharan (3/30/10)

A Cheryl The atmospheric concentration of oxygen is about 20%. The atmospheric concentration of carbon dioxide is about 385 parts per million. In terms of global climate change the problem really is the increasing concentration of the gas CO₂ - which absorbs infrared radiation. Any accompanying changes in oxygen concentration are going to be quite small. The buildup of oxygen in the atmosphere was far longer than 2000 years ago. Cheers, Gregg

Q I am working with a number of state organizations in Maine regarding the calculation of CO₂ emissions from oil- and gas-fired heating systems. One organization is decreasing CO₂ emissions by the efficiency of the heating system. I would like a detailed resource for the calculation of CO₂ emissions from fuel oil and natural gas per unit combusted (the equations from which the pounds per gallon or therm, or pounds per million Btu are derived) so that I can show the managers of this organization that the efficiency of the heating systems should not be included in the calculation. Of course, we all agree that adding insulation will

reduce the amount of fuel burned, and thereby reduce CO₂ emissions, but this organization is claiming even greater savings by including the heating system efficiency. I am in need of a credible source of information. Thank you (3/30/10)

A Rick: This is probably no. 2 heating oil, and gas is fairly easy. ASHRAE has material on how to calculate energy savings from insulation, once an energy value is obtained and converted to BTU, then the carbon coefficients (grams of carbon per 1000 BTU) are found in EPA <http://epa.gov/climatechange/emissions/downloads/0/US-GHG-Inventory2010-ChapterAnnex2.pdf>. Start at about Table A-32. There is currently some controversy of the value for no. 2 heating oil, you can look at the numbers and pick one best for your purposes. TJ Blasing

Q I am aware that the emission of carbon dioxide from fossil fuel burning is inevitable and nature has its own ways of assimilating carbon dioxide biologically and geochemically. However, I would like to know how chemistry can devise ways to curtail the quantity of carbon dioxide already present in the atmosphere and in the exhaust streams from both industry and automobile (3/30/10)

A It is possible to physically or chemically extract CO₂ from the atmosphere or from exhaust streams, without this we would not have spaceships or submarines. But it is energetically expensive to do this and we are confronted with the question of what to do with the CO₂ once collected. This is an area of active research and development and there is a huge amount of literature. I suggest that you Google "carbon capture and storage" and you will no doubt find literature appropriate to your direct interests. Gregg

Q CDIAC Anthropogenic Global Warming and Climate Change: I read and hear that present day scientific consensus indicates that humans have injected enough CO₂ emissions into the atmosphere in sufficient amounts since the 1850s to substantially add to the postulated present day Global Warming increase and its consequent Climate Change effects. However, some people seem to strongly dispute that any of Man's CO₂ contribution constitutes any effect at all, or perhaps that it is only minimal at most in contributing to the measured rising CO₂ PPM count in our atmosphere and/or any associated temperature rise. They minimize any of Man caused possible increased CO₂ level effects and also disallow any accompanying associated increased temperature increase effect with it. They say the correlation is unproven, small, or does not exist at all. I find that position hard to believe, and would like to know some simple, fairly solid proof to the contrary, if it exists. So, can your ORNL scientists/experts provide me with your most recent CDIAC overall confidence level of the certainty that Man's fossil fuel combustion and rain forest burning, etc. are in fact causing and contributing to this temperature rise? That is to say, I wish to be pretty much able to overwhelmingly refute the opinion that Man's CO₂ is not (substantially) contributing to GW+CC and the postulated associated atmospheric temperature rise, if that case can now be pretty much scientifically certain or proven! (3/27/10)

A With a theory as complex as this one is, it requires perhaps 100,000 pages of peer-reviewed literature or more for the evidence to be sufficiently overwhelming that we are willing to buy into it. Approximately 300,000 pages have been summarized in the IPCC WG1 AR4 report below. Some of this evidence is shaky, some is not, but a rather clear picture emerges. Here is the link to browse as you wish, according to your own level of expertise: <http://www.ipcc-wg1.unibe.ch/publication/wg1-ar4/wg1-ar4.html>. In a nutshell, the physical mechanisms for carbon dioxide causing tropospheric warming are well known and have been for a century or more. Absorption of energy excites certain molecules which then reradiate the absorbed energy in all directions, one of which is "back down." Unfortunately this is taught in physics courses which most people haven't had. Other causes of climate change have been active since there was a climate; they operate over various time scales and have some effect on current climate as well. This is summarized in Figure SPM2 in the document I linked above. Motion of the ocean, oversimplified by the media as El Niño, is also important as warm and cold water masses arise after years and often centuries in the deep ocean. Some of us think that what is causing the current leveling off (even cooling in some cases) of the global near-surface temperatures (see attached article). Usually, however, we accept 30-year (or longer) trends for statistical reasons and the 30-year trend is clearly in the warming direction. The causes, except for motion of the ocean, are broken down in Figure SPM2. As the attached article shows (see quick summary in the long paragraph just below figure 4), even motion of the ocean (included in the article as a more complete initialization of climate models) will not affect warming more than a decade or so. Some other mechanism will have to counteract the increasing greenhouse effect to slow global warming and in the absence of an obvious such mechanism, we are concerned about warming in the near term. In the much longer term, tens of thousands of years, humankind will probably have to worry about another onset of large continental glaciers. Most of the rest of the story (either side) is hype. Now, the larger issues, as context is important: What does this all mean for our grandchildren's supply of food, water, and petrol, and for conflict at various scales. Given current rates of population growth, petrol reserves shrinkage, depletion of the Ogallala Aquifer, and such, natural climate variations make things even more complex and additional climate change could make things worse if we are not ready to adapt. Some of us are thinking in this larger context, as some results tend to be the same, such as the wisdom of reducing petrol consumption, for example. T.J. Blasing

[TJ] attached the file "Keenleysideppt" to this response

Q At this link <http://cdiac.ornl.gov/ftp/trends/emissions/usa.dat> there is data on emissions from gas flaring - how were these numbers arrived at? ... by some actual measurements? by modeling? with what assumptions? (3/27/10)

A The United Nations Statistics Office reports data on the quantity of gas flared, by country. Presumably these data are reported by the countries themselves. We use the average composition of flared gas and assume that all of the carbon in the gas is converted to CO₂. Gregg

[B. Arrindell replies] Thank you for your reply. Can you give me a link to the United Nations Statistics office reports of flaring? I have to admit I got lost looking on the info on the UN website - even within the United Nations Statistics Office! Thanks B

[Gregg replies] We get the full UN energy data set annually. It comes as a very large electronic data file so we do not ever end up looking through their on-line data offerings. We would be the first to admit that it is a very large data file and that working with it is not a simple task. gregg

Q Hi, I am currently writing a paper about the equal distribution of responsibility in the sense of who has to take how much responsibility in tackling climate change. I was wondering if you help me, by answering one question: How much CO₂ emissions per GDP are China on one hand and the US on the other hand allowed to emit so that we can tackle climate change? Do you also have data on reduction of emissions per capita? I thank you in advance. Best regards, Evrim (3/26/10)

A http://ecofys.com/com/publication/brochures_newsletters/distribution_of_emission_allowances_under_the_greenhouse_development_rights.htm You are entering an area of intense current research and analysis and there is a great deal of opinion and speculation. I do not endorse this particular paper, but the web site above gives you one such example and there are many more with different ideas. Google "contraction and convergence" and you will find much more in this area. Read any or all of these with your own sense of judgement and evaluation. The key to your query is that neither the US nor China have any legal commitments to reduce anything. Gregg

Q You have been helping me with data for a report. I just wanted to check something. In most of your published tables, the last year given is 2006, but you have published some tables with 2008 as an update, and some graphs with 2010 data. Please would you let me know the different bases of these three sets of figures? Many thanks, Merlin Stone (3/26/10)

A Basically, all of our formal tables are based on energy data from the United Nations Statistics Office. Because of frequent requests, the last couple of years we have been producing preliminary estimates for the last couple of years using extrapolations based on energy data from BP Corporation. These now go through 2008 and will generally turn out to be quite close when we have the full UN data. We do not have any estimates for 2009 or 2010 so any graphs that do this update have to be parallax problems looking at the graphs. Actually, we have published one graph that includes a global total value for 2009. The extrapolation is based on the demonstrated relationship with GDP and uses early projections for 2009 global GDP.

Q Hi, I have a question about the published "THE INCREASING CONCENTRATION OF ATMOSPHERIC CO₂, HOW MUCH, WHEN AND WHY?". At page 18, you have a graph of the global CO₂ emissions from fossil fuel consumption and cement production. How accurate would you say that the estimates are? What contributes to CO₂ emissions except from fossil fuel consumption and cement production? If you would be kind to answer these questions as quick as possible, I would be very thankful. Kind regards, Martin Aandstad Nilssen (3/24/10)

A Martin, I'm going to pass this e-mail on to Gregg Marland who can best answer the question about accuracy, other than to say that the estimates are probably accurate but not very precise in many cases. The most complete list I know of for greenhouse gas contributors can be found at <http://epa.gov/climatechange/emissions/downloads/0/US-GHG-Inventory-2010-Chapter-Trends.pdf> along with their emissions estimates for the USA. TJ Blasing

[from Tom Boden] Hi Martin, We believe, based on Monte Carlo analysis, our global fossil fuel CO₂ emissions estimates are within +/- 10%. The other major human source of CO₂ emissions is from land-use changes (e.g., converting a forest to an agricultural field). There are numerous natural sources and sinks of CO₂ (e.g., plants take up CO₂ during photosynthesis and respire CO₂ back to the atmosphere). Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q According to the UN MDG/ CDIAC, Saudi Arabia emitted around 381,564 thousand tonnes of carbon dioxide in 2006. This is equivalent to 15.78 tonnes per capita. Can you please provide me with a breakdown of these emissions in terms of energy, transport, waste, agriculture etc. any type of breakdown you have would help. So I know what is included in your boundaries. Kind regards, George (3/23/10)

A Dear George, Regrettably we do not produce sectoral emissions estimates for our national fossil fuel CO₂ emissions estimates each year. The underlying United Nations energy consumption statistics are not sufficiently detailed for each country to permit us to break things down by sector, only by major fuel category (http://cdiac.ornl.gov/trends/emis/tre_sau.html). We use the more abundant energy production and trade data to produce our national emissions estimates. You might check with the International Energy Agency in Paris for international sectoral emissions estimates. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q How many ppm of CO₂ will be released into the atmosphere by an exhaust stack emitting 65,000 pounds of CO₂ per day? (3/23/10)

A Keith, The answer will depend on how many days it emits. Roughly speaking, about 7 X 10¹⁵ grams of carbon dioxide is 1 ppm, assuming it all stays in the atmosphere and is evenly distributed throughout the atmosphere. In fact, about half of the CO₂ will go into the oceans or be absorbed by the terrestrial biosphere in the reasonably foreseeable future. Hope this helps. TJ

Q I'm taking a close look at your monthly weather station data. Can you give me some data hygiene recommendations? Currently I'm dropping the -999.99's and perfect zero's. I'm likely to drop any station having less than 12 monthly readings per year which looks to be over 10%. What do you think? Rich (3/19/10)

A Hi, Well, if "clean up" is what you sorta mean by hygiene, your method/actions are dependent on what you want the data for. If you are looking at trends in annual mean over some long period of record, you'll certainly want to address years with missing monthly values. Most folks would drop those years and calc. means of years with 12 months. If you want a 100-year time series then you have to decide how many missing years you can tolerate for your analysis. Sometimes these decisions are quite arbitrary, like 5 or 10% like you mention. If you want a 1901-2000 time series, but a bunch of your missing (perhaps up to 10 years) years are stacked near the beg./end of the series, that will weight things very differently than if the missing years were nicely distributed over the period of record. You have to consider the spatial coverage of the network that results from your various decision thresholds. There are many things to consider and you can see ideas that others have used by exploring the climate literature. Good luck, Dale Kaiser CDIAC

Q Dale Kaiser, Do you know what the difference is between the monthly precipitation data on these two websites (or if there is one)? 1) http://cdiac.ornl.gov/epubs/ndp019/monthly_new.html hcn94pcp.asc.Z 2) http://cdiac.ornl.gov/epubs/ndp/ushcn/monthly_doc.html 9641C YYYYMM F52.pcp.gz Also, it seems most documentation on the USHCN data is for temperature not precipitation. Do you know what the most current documentation for precipitation is? Last, I noticed that the precipitation data is unadjusted. Does this mean that the data is raw? Many thanks, Amalia Anderson PhD Candidate Physics Department Michigan Technological University (3/19/10)

A Hi Amalia, First answer, YES, these two data files are different. Source 1 is old and I'm surprised to see that the html page is still linked to from some other page (I assume you found a link on another page anyway). Could you tell me how you landed there? We need to pull that page and related pages offline - at least as far as them being linked to. I will also consider the contents of the ftp directory. I thought we had archived those old files too. Source 2 is the current and correct version of HCN data to be using (vs. 2). As far as how precip. may differ between files, the main things will be that the station network has changed a little bit over time and the vs. 2 data extend through 2008 on our site (soon to be 2009). These monthly precip. values have always been checked for reasonableness using manual checking of extreme outliers using historical values and nearest neighbor checks. Good old fashioned QA. So, precip. is mainly "raw" in the sense that values are not often adjusted, but flagged as suspicious or set to missing. Temperatures can be adjusted using various algorithms b/c of the spatial nature of temperature being a lot more smooth usually than precip. Please note that the following section - HOMOGENEITY TESTING AND ADJUSTMENT PROCEDURE in http://cdiac.ornl.gov/epubs/ndp/ushcn/monthly_doc.html says that precip values are not adjusted like temps are. So, lastly, please only use HCN data that comes from links starting at this page: <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> Good luck with your analysis and thanks for using our site. Dale Kaiser CDIAC

Q I have been exploring your site in the hope of finding the data (numerical) that you use to compute trend analyses. The reason for this is that I can readily compute trends, complete with all the inferential statistics which your plots (though excellent) lack. That is not the problem, though! I wish to apply a different method of analysis in which the major interest is in identification of possible abrupt and enduring change for which I need the data values themselves. Can you help, please? Robin (3/18/10)

A Hi Robin, We certainly have lots of different types of data and I'll be happy to point you to actual data. Let me know what specific type of data you are looking for and I'll guide you further. For example, if it is the global fossil fuel CO₂ emissions estimates you need the data table with the values is located at http://cdiac.ornl.gov/ftp/ndp030/global.1751_2006.ems I look forward to your reply. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear Sirs, I am a retired physicist and doing some - voluntary - research in the field of "how to teach people about climate change" - partly on behalf of Cleanstate (www.cleanstate.de) partly on my own. I am trying to understand the basic work of the 1980s in particular I am interested in the paper of Quinlan (NDP-019 of 1987). Is it possible to provide this report in electronically readable form (like PDF-files). If yes, I would appreciate to get that file. I understand that sending this document abroad does not include any fees so far. Thank you in advance for your consideration. Yours truly Joerg Kampmann, Dr. Dipl.-Phys. PS: if you do not have the document can you please forward me an addressee where I could get it. Thanks JK --

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===== (3/15/10)

A Dear Joerg Kampmann, We appreciate your question to the CDIAC Web site. I don't believe we have ever made an electronic version of the very first USHCN document from 1987. I can point you to a subsequent version of part of the documentation from some years later that still had data in the same format and used the same methods <http://cdiac.ornl.gov/ftp/ndp019/ndp019r3.txt>. However, I would encourage any future use of the US climate data to be done from here: <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> which has the most current data and methods. The old ndp-019 documentation and the new "Vs. 2"

of USHCN of course both cite literature that will tell you the most detail about methods employed in each version of the database
Sincerely, Dale Kaiser

Q If we changed all electricity production in the world from Coal to natural gas, we will emit a lot less CO₂, Have anyone calculated what the effect would be if all electricity production was changed from coal to natural gas. I think this would solve the CO₂ problem (3/13/10)

A Not all electricity is generated from fossil fuel combustion; appreciable amounts come from nuclear and hydropower, and some additional power comes from biofuels. Switching from any of these to natural gas would increase fossil carbon emissions. Roughly speaking, coal releases about 25 g of carbon per Mj of energy, the comparable number for natural gas is less than 15; so one gets about 60% as much carbon per unit of energy from gas. Moreover, gas-fired plants are sometimes more efficient than Coal-fired plants. So, it would seem to make sense to switch to gas. However, that's not the only factor involved. Coal may be cheaper and/or more available than natural gas, it may be easier to haul coal by train than to build a natural gas pipeline, etc. Things are seldom, if ever, quite as simple as we would like them to be. However, your basic reasoning is sound, switching from coal to gas could appreciably reduce carbon emissions. TJ Blasing

[from Gregg Marland] Just as rough numbers, Natural gas has about 60% as much CO₂ emissions as coal, about 1/3 of CO₂ comes from electricity generation, and (I am traveling and do not have the number with me so am guessing), globally about 80% of fossil fuel electricity is from coal. The conversion of all coal-fired electricity to natural gas would reduce total emissions by $(.6) \times (.33) \times (.8) = .16 = 16\%$. This would certainly be a major contribution to reducing emissions but it is not what people claim is needed. Gregg

Q In your historic figures dating as far back as 1751, I believe that you are taking fossil fuel consumption and converting into CO₂. Can you please provide the conversion factors that you are using for gas, liquid and solid? What are your sources for the fossil fuel consumption by country by type? For the categories gas, liquid, solid, what other fossil fuels are you including besides natural gas, petroleum and coal? For something like coal, is it included in gas or solid? Your assistance with these questions are appreciated (3/13/10)

A http://cdiac.ornl.gov/trends/emis/overview_2006.html On the opening web page (above) for our data set you will find a summary of the methods used plus full reference to all of the methods and data sources. Gregg

Q In doi 10.3334/CDIAC/00001 (Boden et al) do the emissions from solids include wood burning or does wood not count as a fossil fuel? (3/11/10)

A "solids" is mostly coal, but in a few countries it includes peat. You are right, wood is not included. Cheers, Gregg

Q If I wish to reproduce your charts giving emission history up to 2010, what is the copyright situation? Do I need to obtain approval for each chart or can you give me approval for all? The charts are of the type shown on http://cdiac.ornl.gov/trends/emis/tre_afr.html (3/11/10)

A All of our data and graphs are in the public domain and for public use. We do appreciate credit lines showing the source of material. We appreciate your interest, that is what we are here for. Cheers, Gregg Marland

[Dr. Stone replies...] Many thanks, that's very helpful, and especially helpful to get such a quick reply. Best regards Merlin Professor Merlin Stone DPhil Hon FIDMFCIM Research Director WCL

Q Since parts per million of carbon dioxide are increasing, what is the gas which is decreasing? The total must add up to 1,000,000 parts. If there is more CO₂, then what is the gas which is decreasing? (3/9/10)

A Hi Marvin, Thank you for your question to the Carbon Dioxide Information Analysis Center (CDIAC) web site. Numerous gases are increasing in the atmosphere besides carbon dioxide and several gases are decreasing (e.g., CFCs). Other species on the decline from previous levels include some of the gases targeted in the Montreal Protocol (e.g., CFC-11). Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear CDIAC, We are authoring a review of environmental problems in China, and would like to use the following figure generated with CDIAC data: https://webdrive.service.emory.edu/users/jremais/Proposed_Lancet_Figure.pdf. The figure will cite CDIAC exactly as specified on the data page. Can you confirm A) that we have permission to publish a figure based on CDIAC data as indicated, or B) that permission for publishing a figure based on CDIAC data is not necessary? Thank you and regards, Justin Remais, Asst. Prof., Environmental Health Emory University (3/5/10)

A Dear Justin, You have our permission to publish a figure based on CDIAC data. Please acknowledge the original source using the citation often listed on the bottom of our web pages. Good luck with the review. Sincerely, Tom Boden Carbon Dioxide

Q I've downloaded daily data at http://cdiac.ornl.gov/ftp/ushcn_daily/ for the state of California File http://cdiac.ornl.gov/ftp/ushcn_daily/state04_CA.txt.gz. After conversion I've looked for the data of Death Valley (Furnace Creek) 042319. There are some missing data because of lack of information from the station. That is okay. I am surprised to see that there are complete months that are not even entered in your lists. A quick check reveals the following months are not even in the files. January 1968, May 73, July 91 and March 2004. Below are a list of entries that are completely missing. I cannot guarantee that those are the only data that are not entered. 196801TMAX, 196801TMIN, 196801PRCP, 196801SNOW, 196801SNWD, 197305TMAX, 197305TMIN, 197305PRCP, 197305SNOW, 197305SNWD, 198207SNWD, 198412PRCP, 198709PRCP, 198709SNOW, 199107TMAX, 199107TMIN, 199107PRCP, 199107SNOW, 199107SNWD, 199412PRCP, 199810SNWD, 200403TMAX, 200403TMIN, 200403PRCP, 200403SNOW, 200403SNWD, 200404SNWD, 200407SNWD, 200412SNWD, , I would very like to obtain the complete lists. Thank you, Best regards, Göran Rudling (3/5/10)

A Goran, Unfortunately some stations are indeed missing data. This is very typical of long-term station data for just about any part of the world. This can be the case for any number of reasons, and is something analysts have to come up with their own solutions for (as far as computing means, trends, etc.). One note: the HCN monthly data for these stations will not have these gaps. The methods used in developing monthly HCN include filling gaps via interpolation of values from surrounding stations - but this is not done for daily. Regards, Dale Kaiser

Q Dear Sir: While searching for historical weather on the internet for a business project I'm working on I came across the following website http://cdiac.ornl.gov/ftp/ushcn_daily/ with various historical state weather history files. I tried to download and unzip the CT file as a test however I can't seem to comprehend what I'm looking at without column headings or a description of the data in the file. Is there any information you can provide regarding the file format of these files? I'm trying to locate historical East Coast weather with regards to a business forecasting system I'm developing in order to explain anomalies when comparing current month actual/ forecast data vs last year actual data where weather would have had a major impact on prior year results (snow storms in the NE, hurricanes in the South). Any help you could provide would be greatly appreciated. Thanks, Mark Merlini (3/4/10)

A Dear Mark Merlini, We appreciate your question to the CDIAC Web site. Here is the documentation you need to make sense of the files: http://cdiac.ornl.gov/ftp/ushcn_daily/data_format.txt. This file is in the same directory you cited. Sincerely, Dale Kaiser CDIAC

Q Can you tell me why the UN MDG Report (2009) states that the global CO₂ emissions are 29 billion metric tons, while the Global Carbon Project states that the total anthropogenic emissions for CO₂ in 2008 is 9.9 Pg (or 9.9 billion metric tons)? Why such a discrepancy? Thank you (3/1/10)

A Hi Zack, I think I can sort this out for you. There are two primary reasons for the differences. The big difference is reporting units. The MGD reports in CO₂ units. The GCP reports in units of carbon. To convert from carbon to CO₂ simply multiply by 3.667 (i.e., the difference in molecular weight between CO₂ and C - 44/12). MGD reports emissions from fossil fuels only. GCP reports total anthropogenic emissions. The two primary anthropogenic sources are fossil fuels and emissions from land-use changes (e.g., converting a forest to an agricultural plot). GCP = ~8.4 PG (fossil fuels) + ~1.5 PG (land-use). If we convert 8.4 PG from C to CO₂, we get 30.8 billion metric tons CO₂. I don't have these estimates in front of me but I am pretty confident the estimates will align well once you compare "apples to apples". Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear Dr. Blasing I am working on an Atlas of Climate Change and want to include some information on changing GHG concentrations. I am a geographer who works on climate impacts and decision making, not a climatologist. My independent efforts to answer this question were not moving forward. I read your 2009 posting on Current GHG concentrations. Perhaps I was overthinking the footnotes but I became uncertain if the units for tropospheric ozone concentrations were in Dobson Units or ppb. IPCC AR4 didn't help me resolve that question and IPCC TAR reports recent concentrations as 34 DU. If it is not too much trouble, would you mind clarifying the units for me? Thank you very much, Kirstin Dow (2/26/10)

A Kirstin, You are a very smart geographer, I will probably be revising my page soon and will make some revisions as per your question. Moreover, I suspect that a new issue of our monthly newsletter will be going out in the next few days and I may put something about this in there, would you mind if I credited you by name? The answer to your question is given below, taken directly from the Third Assessment Report (AR3) of IPCC. IPCC kind of assumes that if you have read the latest (AR4) report (2007) you also read AR3 and know all this stuff. We scientists sometimes fail to communicate adequately to the public, and people like you who are not afraid to ask questions like yours can help the communication process, so keep up the good work. TJ Blasing
ANSWER 4.2.4 Tropospheric O₃ Tropospheric O₃ is a direct greenhouse gas. The past increase in tropospheric O₃ is estimated to provide the third largest increase in direct radiative forcing since the pre-industrial era. In addition, through its chemical impact on OH, it modifies the lifetimes of other greenhouse gases, such as CH₄. Its budget, however, is much more difficult to derive than that of a long-lived gas for several reasons. Ozone abundances in the troposphere typically vary from less than 10 ppb over remote tropical oceans up to about 100 ppb in the upper troposphere, and often exceed 100 ppb downwind of polluted metropolitan regions. This variability, reflecting its rapid chemical turnover, makes it impossible to determine the tropospheric burden from the

available surface sites, and we must rely on infrequent and sparsely sited profiles from ozone sondes (e.g., Logan, 1999). The total column of ozone is measured from satellites, and these observations have been used to infer the tropospheric ozone column after removing the much larger stratospheric column (e.g., Fishman and Brackett, 1997; Hudson and Thompson, 1998; Ziemke et al., 1998). The current burden of tropospheric O₃ is about 370 Tg(O₃), which is equivalent to a globally averaged column density of 34 DU (Dobson Units, 1 DU = 2.6871016 molecules/cm²) or a mean abundance of about 50 ppb, see Table 4.9. PS from TJ. The addition of the stratospheric ozone to the TOTAL column ozone to around 300 DU, in case you have read something about total column ozone. The above material is on tropospheric ozone only. When people ask what I do for a living I sometimes reply that I am a greenhouse gas accountant. This may give you a flavor of why I use the term "accountant"

[Kristin responds] TJ Thank you for the explanation and the generous words. As long as I work on climate change, I know I am always going to be a student of something and it is nice to not have to worry about asking. You can use my name in the newsletter if you like. This atlas project is part of my effort to help in that communication realm. If you are interested, this is the website <http://www.climateatlas.net/>. Best, Kirstin

Q To whom it may concern, How is it possible that scientists can differentiate that carbon dioxide (CO₂) that is in the atmosphere from human-caused activity and, that carbon dioxide (CO₂) that is in the atmosphere from natural mechanisms? It is my understanding that carbon dioxide (CO₂) is carbon dioxide (CO₂)...PERIOD. One carbon atom and two oxygen atoms regardless of how it is produced. So, how is it possible to tell some particular given carbon dioxide (CO₂) element is produced by oil, as opposed to another carbon dioxide (CO₂) element being produced by rotting vegetation, for instance? Frankly, I don't quite see how this is possible. Thank you for your time and attention (2/24/10)

A Thanks for your question to the Carbon Dioxide Information Analysis Center (CDIAC). Not all molecules of carbon dioxide (CO₂) are the same and individual atoms of carbon (C12, C13, C14) and oxygen (O16, O18) differ. Fossil fuels are devoid of C14 because of the radioactive decay of C14 to 14N during long underground storage and are depleted in C13 because of isotopic fractionation long ago during photosynthesis by the plants that were the precursors of the fossil fuels. Carbon dioxide produced by the combustion of fossil fuels is thus virtually free of 14C and depleted in 13C. This phenomenon is known as the "Seuss Effect". In addition, different fuels have different isotopic carbon signatures. Coal from Wyoming is different from coal from West Virginia. Oil from one field has a different isotopic signature from oil from another field. Coal, oil, and natural gas have distinctly different isotopic signatures. In my mind, it is the consistency with the trends in the abundances of these isotopic species in the atmosphere which points squarely to fossil fuel emissions as the reason for the rise in atmospheric CO₂ levels. Sure the increase in atmospheric CO₂ levels since the 1950s correlates well with recent increases from fossil fuel emissions and the hemispheric gradients are correct (i.e., the majority of fossil fuels are consumed in the Northern Hemisphere and atmospheric levels of CO₂ in the NH are typically 3-5 ppm higher before interhemispheric mixing), but it is the consistency with the isotopic measurements and trends since the 1950s that makes the argument so compelling. What other possible explanation exists where you could deconvolve the emissions trends AND the CO₂/isotopic trends in the atmosphere? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q I am looking for the most recent numbers for fossil fuel CO₂ emissions for the world, for all countries, and for the state of North Carolina. When searching your site I can only find 2001 data for NC. Do you have 2007 data? I want to make sure I am comparing apples to apples in terms of methodology, etc. Thank you, Rita Leadem (2/23/10)

A Rita: EPA now keeps the state carbon emission estimates. Their methodology is quite complete, state of the art, etc. and is explained well in their documentation http://www.epa.gov/climatechange/emissions/state_energyCC2_inv.html. They account by economic sector, rather than by fuel. They also use a bottom-up approach, we use a top-down approach. These differences make detailed comparisons difficult or impossible. The attached "MITI PAPER" discusses some of our (top-down, by-fuel) state-by-state methodology. The country-by-country and global estimates are made by a different methodology. The attached "annual cycle" paper discusses differences more differences in methodology. In general, the methodologies are pretty confusing even to us sometimes. That is why I describe myself as a "greenhouse gas accountant". For general trends comparisons might be OK. All things considered we agree reasonably well, but some of the differences may be important for your work. T.J. Blasing

Q Hi, I would like to reproduce the figure <http://cdiacornl.gov/trends/CO2/graphics/SIOMLOINSITUTHR2008.JPG> from Keeling R.F., S.C. Piper, A.F. Bollenbacher and J.S. Walker, 2009 in a scientific communication. Could you grant me permission? Thanks a lot in advance (2/22/10)

A Dear Jean-Philippe Puyravaud, We appreciate your question to the CDIAC Web site. All of our reports, graphics, data, etc. are freely and publicly available. We only ask that credit be given to the true contributing investigator of the data, e.g., Keeling et al., as you cite above. Sincerely, Dale Kaiser CDIAC

[from Tom Boden] Dear Jean-Philippe, Thank you for seeking permission to reproduce one of the figures on the CDIAC web site. You have our permission to reproduce the figure in your scientific communication but we insist you acknowledge the original source (i.e., Keeling R.F., S.C. Piper, A.F. Bollenbacher and J.S. Walker, 2009) and ask you mention the data were obtained from CDIAC. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q Dear Dale, The USHCN website no longer includes the urban adjusted (e.g., ANN_AVE_UTAVE) and unadjusted (e.g., ANN_AVE_TAVE) temperature data. Are the data on website adjusted for urbanization and land cover change? In other words, can I use the data to look for direct changes in climate? Thanks Jeremy (2/22/10)

A Jeremy, Sorry to be slow in responding. The bottom line answer to your question is certainly YES. To understand the how/why you will want to see the USHCN vs. 2 documentation on our site and also a slightly different/updated page on NCDC's website. Also, at the bottom of these web pages, there are references to recent literature pubs that explain the details of vs. 2 homogenization. Here are the various links: http://cdiac.ornl.gov/epubs/ndp/uschn/monthly_doc.html <http://www.ncdc.noaa.gov/oa/climate/research/uschn/> Regards, Dale Kaiser CDIAC

Q Dear CDIAC, I have a question regarding the amount of Fossil Fuel CO₂ emissions published on your website and the estimates published on the UN MDG website (<http://mdgs.un.org/unsd/mdg/Data.aspx>). If I look at your estimates for the total CO₂ emission from fossil fuels for the US in 2006, I find 1568806 thousand metric tons of CO₂. If I look at your estimates for what I believe the same types of emissions, I find for 2006 for the US, 5752289 thousand tons CO₂ which is very different. Could you please explain me the difference in these numbers? Thank you very much in advance. Best regards, Gisèle Schmid University of Geneva (Switzerland) (2/19/10)

A Dear Gisèle, Thank you for your question to the CDIAC website. Our emission estimates are reported in units of carbon (C). The UN reports in units of carbon dioxide (CO₂). Both are acceptable units to report. To convert from C to CO₂ simply multiply by 3.667 which reflects the differences in molecular weight of C (12) and CO₂ (44). I think you'll find the estimates to be very similar. Thanks, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Do you have any more current data than 2006 on country-specific carbon emissions? Thank you. (2/17/10)

A I forgot to "copy all", but I did answer this one. Gregg

Q Hello I am a researcher in the Univ of Arkansas LR, AR, USA. I could get data from 1980 to 2007 for USA (not by state) from the source (U. S. Emissions Data: Greenhouse Gas Emissions- (CO₂) - History from 1949 XLS) I am interested in getting historical data on CO₂ emission by economic sector state-wise from 1960 to date. (If data for prv yrs are available it is fine). Pl advise. Thanks Ram CDIAC: http://cdiac.ornl.gov/trends/emis/tre_coun.html from <http://cdiac.ornl.gov/trends/emis/overview.html> Srch: fossil fuel CO₂ emissions (2/16/10)

A Ram: We do by fuel only, EPA has state by state for economic sectors but only back to 1990. http://www.epa.gov/climatechange/emissions/download/CO2FFC_2007.pdf Sorry I couldn't be of more help. TJ Blasing

Q Hi Dale, Good morning! I work for a research firm and I was wondering if you could help me with some weather related data that I need for the US. I followed some interesting links from NWS right up to USHCN which I believe holds weather related data (both monthly and daily) for US. However I am unable to understand the workings of the website and some of its links. I basically wanted to compare weather conditions (average temperature, snow, precipitation etc.) in US for Dec'09, Jan'10 and Feb'10 with months exactly one year back (i.e. Dec'08, Jan'09 and Feb'09) to conclusively prove that this year the weather has been very bad and is thus hampering economic activity. So, could you please help me find my way through to this data? It would also be great if you could tell me whether there are region-wise averages (say East U.S., Central U.S etc.) so that we can club states together and get a weather for the region? Looking forward to help from you. Have a great day ahead! Thanks & Regards, Pritam Nanda Research Analyst, Irevna Research Ltd. +91 22 4047 2208 (2/16/10)

A Hi Pritam, Actually, the USHCN database will not be the best thing for your analysis. We only have data through 2008 right now (will be through 2009 in a few months). USHCN is good for long-term monitoring. But it will not give you data from recent months. I believe a good resource for you can be found here: <http://www.ncdc.noaa.gov/oa/climate/research/2009/cmb-prod-us-2009.html> ...i.e., from NOAA's National Climatic Data Center in Asheville, NC (who also compile USHCN). These pages will not readily show Jan of 2010, but it may be a starting point to finding it. You may have to call a contact number on an NCDC web page to see if they have Jan. summaries yet. Best wishes, Dale Kaiser

Q Could you tell me please, where I can get the information about carbon dioxide production per unit fuel burnt, completely for coal, lignite, natural gas etc. Thank you very much (2/16/10)

A Usually the emissions factors are given in terms of gas emitted per unit of energy realized from combustion. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf This is unfortunate because you then need to know the specific heat of the fuel you are combusting and there are some non-trivial accounting details. Most countries use the "lower" or "net" heating value. The (gas emitted)/(energy) will depend on whether the lower ("net") or higher ("gross") heating value is used to calculate the energy realized from combustion. So, before you use the gas/energy tables be sure they specify whether they use the "gross" or "net" heating value. The link I gave above is supposed to be using the lower ("net") heating value. Heating values vary by fuel and by region. Hopefully you can find someone who can give you the heating values of fuels for Indonesia. http://hydrogen.pnl.gov/filedownload/hydrogen/datasheets/lower_and_higher_heating_values.xls Gives values for fuels in the United States. I apologize in advance for the units used, as our country is not as scientifically advanced as Indonesia in this respect.

Q Hi, I am trying to find the low temperatures for this location over say the past 5-6 years. The reason is that our company sells products to help keep the paraffin in the produced oil liquid when it cools down. This year, we have noticed a reduction in efficiency of these treatments. We wonder if the temperatures this year have been cooler than normal (I live in Houston and think so). It would be nice to show graphs of the past years and this year showing any differences. If you could point me in the correct way to get this data, I would appreciate it. I have tried accessing the web pages, but it is not clear. Many Thanks Mike Jackson
Champion Technologies (2/12/10)

A Hi Mike, Historical data through 2008 can be obtained here: <http://cdiacornl.gov/epubs/ndp/ushcn/access.html>. For 2009 data, there is a wealth of summaries here: <http://www.ncdc.noaa.gov/climate/monitoring/index.php> (These are ongoing each year and are building up on this site for the past 10 years or so.) Lastly, the various NWS regional offices often have links for data over recent months, e.g., for Houston: <http://forecastweather.gov/MapClick.php?CityName=Houston&state=TX&site=HGX&textField=29.7687&textField2=-95.3867&e=1> ...you might see the "SE TX Climatology" link in the lower right. Or this page one gets when you type in Haynesville, La in the box at the top of the above page: <http://forecastweather.gov/MapClick.php?CityName=Haynesville&state=LA&site=SHV&textField=32.9669&textField2=-93.1378&e=0>. Again, see the "local climatology" link on that page. Dale Kaiser CDIAAC

Q Is carbon dioxide uniformly distributed around the earth? or are there some areas with higher concentrations than others? if so how was this verified? secondly what is the vertical distribution of carbon dioxide in earth's atmosphere? thank you indeed
(2/11/10)

A Dear James Goodman, We appreciate your question to the CDIAAC Web site. The answer to your first question is technically "no" (if we think in terms of a snapshot at any particular time), but in the broader scope of long-term climate and radiative forcing issues, it is really more "yes". What I mean by "no" - please see this resource that can and does explain this much more thoroughly than I could: <http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/>. What I mean by "yes" is, that in terms of the radiative "forcing" of climate by increasing atmospheric CO₂, the global average in ppm (over the long term) is the main thing that climate models can work just fine with. Such a global average can be constructed with annual averages from a number of sites across latitude, or even using the "gold standard" record from Mauna Loa, Hawaii: <http://cdiacornl.gov/trends/CO2/sio-mlo.html>. Regarding your 2nd question, CO₂ is also well-mixed vertically in the atmosphere. See, for example: <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/>; <http://www.nature.com/nature/journal/v316/n6030/abs/316708a0.html>. Sincerely, Dale Kaiser

Q Dear CDIAAC, Your analysis shows that Chilean CO₂ emissions were 16,391,000 metric tons (year 2006). The problem is that in the year 2006 Chile had more than 1500 MW in coal power plants. Considering coal power emission of 1 kg CO₂ / kwhe and a capacity plant factor of 90% and an electrical efficiency of 38%, the total emissions on 2006, just because of coal power generation had to be at least 11,826,000. (Larger than the amount of 3,193,000 CO₂, that CDIAAC shows in the tables) I would appreciate if you could give me some comments about that. Best Regards José Manuel González (2/9/10)

A Dear José, Thank you for your comment to the Carbon Dioxide Information Analysis Center (CDIAAC) website. First and foremost, please realize our estimates are presented in units of carbon and not CO₂. Our Chilean emissions estimate for 2006 was 16,391,000 metric tons of carbon (C), not CO₂. To convert, multiply our values by 3.667 (i.e., difference in molecular weight between CO₂ and C or 44/12). Our Chilean emissions estimates are based on data reported by the United Nations. The United Nations sends questionnaires each year to individual nations worldwide. I do not know what agency or person is responsible for completing the questionnaire in Chile. I have extracted all of the Chilean coal and electricity data for 2006 from the UN database and pasted it below for your review. Where do the values in your e-mail originate? Please compare the values in the UN database to your original source and inform me of the UN values in error. I will be happy to relay your pointed concerns about specific values to the UN for review so long as you provide credible sources for your preferred values. Any revisions to the UN data will naturally cascade to our updated emissions estimates through 2007 or 2008. Many thanks, Tom Boden
Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory
country year cdy trans quantity qcode
152 2006 CL 01 396 WSR
152 2006 CL 03 5009 WSR
152 2006 CL 06 3 WSR
152 2006 CL 08 4761 WSR
152 2006 CL 121 620 WSR
152 2006 CL 123 15 WSR
152 2006 EC 133 13651 ESR
152 2006 EL 01 57555 HWU
152 2006 EL 019 56226 HWU
152 2006 EL 03 2285 HWU
152 2006 EL 09 727 HWU
152 2006 EL 101 7138 HWU
152 2006 EL 102 1329 HWU
152 2006 EL 121 34135 HWU
152 2006 EL 122 325 HWU
152 2006 EL 123 16187 HWU
country = the UN country code (code 152 = Chile) cdy = commodity code (CL = coal, EC = electricity capacity, EL = total electricity) trans = transaction code 01 gross production 03 imports 06 changes in stock 08 conversion to other forms of energy (e.g., in blast furnaces) 09 consumption by the energy sector (e.g., mining industry) 019 steam & hot water from heating plants 101 losses in conversion, transportation, and distribution 102 station use and loss 121 consumption by industry and construction (e.g., iron & steel industries) 122 consumption by transportation sector (e.g., rail) 123 consumption by households 133 installed total electricity qcode = units WSR thousand metric tons ESR thousand kilowatts HWU million kilowatt hours For example, line 2 would be translated as Chile imported 5009 thousand metric tons of coal in 2006.

Q I have question in connection with the CO₂ emission table http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls Which units are the emissions in? Thank you in advance Best regards, Cecilie Fenger Research Assistant Center for Advanced Security Theory University of Copenhagen (2/8/10)

A Cecilie Gg-C = gigagrams of carbon = thousand metric tons of carbon Thus the United States total (column AA, row 5) is given as 1547460 Gg-C. For the USA and countries with emissions of similar magnitude I prefer teragrams of carbon so it would be 1547.56 Tg-C, or million metric tons of carbon. Now for the tricky part, including the oxygen so as to represent carbon dioxide Multiply by 44/16 = 3.67 to get about 5679.2 million metric tons of CO₂. TJ Blasing

Q Dear Dale Kaiser, For the monthly data provided for each site, what defines precipitation? Does precipitation account for all types of precipitation (snow included) or just precipitation falling as rain? Also, is the value given for each month the average precipitation for that month or the accumulation of precipitation for that month? (Web Interface--> select site--> "get monthly data" --> "create and download file of monthly data" --> precipitation) For the daily data provided for each site, is the snowfall value given for each day the daily average or daily accumulation? (Web Interface--> select site--> "get daily data" --> "create and download file" --> snowfall) Thank you for your time, Adrien (2/8/10)

A Hi Adrien Pls. see below. On Feb 7, 2010, at 1:38 PM, Adrien Wilkie wrote: Dear Dale Kaiser, For the monthly data provided for each site, what defines precipitation? Does precipitation account for all types of precipitation (snow included) or just precipitation falling as rain? Also, is the value given for each month the average precipitation for that month or the accumulation of precipitation for that month? (Web Interface--> select site--> "get monthly data" --> "create and download file of monthly data" --> precipitation) Precip is the liquid equivalent for all forms of precipitation. If there was any frozen precip, it was melted then measured so it is just like accumulated rain. Monthly precip is accumulated amount, not average. Once you have clicked on "precipitation" along this path you quote, you'll notice that you have skipped down the page to "Write a comma-separated file of monthly data to a download area", so yes, at this point what you are getting is actual accum precip for each month. Notice that the block below that give you the option of having the monthly values summarized by year, calendar or hydrologic. For the daily data provided for each site, is the snowfall value given for each day the daily average or daily accumulation? (Web Interface--> select site --> "get daily data" --> "create and download file" --> snowfall) Actual daily accumulation Pls. note, next to the "get monthly/daily data" links on the map interface are the links for monthly/daily documentation. If these don't answer your questions just holler. Regards Dale Kaiser CDIAC

Q I have heard that the climate change we are seeing today is from the effect of carbon dioxide entering the atmosphere 30 years ago. 1) Is that true? 2) If it is true: what are the inertias in the climate system that would slow down the effect of carbon dioxide? I have read about feedback loops that are positive and negative and also the absorption capacities of the ocean and land carbon sinks. However, if the earth was able to absorb much of the CO₂ then unless it gets released for other reasons there is no time lag. At the point when land and sea can no longer absorb CO₂ then whatever goes into the atmosphere will have an almost immediate effect. In a BAU case how far away from that scenario are we and what would be the devastation even before this state was reached. David Garland P.Eng. Senior Mechanical Engineer Tel: 306.978.7730 x217 Fax: 306.978.7729 (2/5/10)

A Hi David, Excellent questions- ones that I cannot address completely. This line of thinking shows that you really appreciate the complexity of the earth-atmosphere-ocean system. One of the major complex systems is the terrestrial carbon cycle, which relates to your time lag thinking. The complex relationships between the many sources and sinks are a specialized area of research, and we have some of those folks here at ORNL. I'm sure you're familiar with the Keeling curve and know that aside from the annual cycle mainly driven by the northern hemisphere biosphere, the upward trend of the curve is not constant and that is where the terrestrial carbon cycle comes in. So, related to these, a few links/sources <http://cdiac.ornl.gov/faq.html#Q4> At this link see the illustration of the carbon cycle; it's not a really new diagram, but is thought to still have things pegged fairly closely. I have not gone through the info. at the other link "find the latest carbon budget estimates", but I would think that would be helpful. And of course, Keeling curve info. is here: <http://cdiac.ornl.gov/trends/CO2/sio-mlo.html> <http://scrippsco2.ucsd.edu/faq/faq.html> While the curve looks fairly well behaved, the rate of change is not constant. This will be effected by annual emissions growth not being constant and of course the interactions of the system's sources and sinks. Along with pointing you to these carbon cycle things, I also refer you to the work of NASA's Jim Hansen. This has to do with the radiative effects of increasing CO₂ influencing the radiative balance of the earth-atmos system over time, and the whole idea of thermal inertia, i.e., slower heat fluxes into and out of the oceans. A key paper about this can be found here: http://pubs.giss.nasa.gov/abstracts/2005/Hansen_et_al_1.html Hansen's page where you "can get anything you want" is: <http://www.columbia.edu/~jeh1/> IMO I think Hansen has always had a good handle on the physics of the problem. Even though he has become more political in recent years (understandable to me), most of us in this field respect his scientific integrity. Hope this is helpful in considering the whole time lag issue. It's so complex due to the myriad interrelated components. Regards Dale Kaiser

Q To whom it may concern, I am a phd student and I need to get a CO₂ emissions annual series for Uruguay, for all the years available. It's for my thesis. I thank you in advance Gioia de Melo (2/5/10)

A Through 2006 <http://cdiac.ornl.gov/trends/emis/uru.html> Caution: These data are in terms of carbon only, and NOT carbon dioxide. To include the mass of the oxygen molecules as well, multiply by 3.67 and you will have the mass of emitted carbon dioxide. TJ Blasing

Q How is the amount of KWH produced relative to the amount of carbon emission released in the United States? (2/3/10)

A Hi Kelsey, Thank you for your question to the Carbon Dioxide Information Analysis Center (CDIAC) website. Let me answer your question two different ways. First according to the US EPA (<http://www.epa.gov/climatechange/emissions/usinginventoryreport.html>) approximately 42% of US CO₂ emissions from fossil fuel combustion in 2007 was the result of electricity generation (i.e., 2397 of 5736 Tg of CO₂ equivalent). Secondly the answer depends on how the KWH of electricity is produced. For example, if the KWH comes from a coal-fired plant like those often used by American Electric Power in Ohio the amount of CO₂ released is directly proportional to the electricity demand. For each metric ton of coal burned (assuming an oxidation rate of ~98%) about 0.746 tons of C is released. If on the other hand the KWH is being produced by hydropower, as is common in the Pacific Northwest, there is no CO₂ released except to run the hydropower facility itself on fossil fuels. Thanks, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q How long does it take for emitted CO₂ to reach the upper atmosphere where it causes green house effect. (2/3/10)

A The mixing time in the atmosphere ranges from minutes to days between the ground and the tropopause (lower atmosphere), about two weeks around a latitude circle at mid-latitudes, several months to reach through a hemisphere, about one year between the northern and southern hemispheres, and several years to mix through the stratosphere (upper atmosphere). But it leads to greenhouse influence even while in the troposphere.

Q Was a bill passed that requires homes or businesses to have in place a carbon dioxide device? (2/2/10)

A Mindy, I am aware of no such bill that was passed by the House or Senate that requires homes or businesses to have some type of carbon dioxide device. Certainly the President has not signed a law that requires any type of carbon dioxide monitoring or capture device for homes or businesses. Sincerely, Robert Andres

Q I meet a problem of carbon emission prediction. I need the data of global carbon emissions. Included different year and different regions. If you have these data or you know the data source, please tell me, thank you very much! (2/1/10)

A All of the data are available on our web site. http://cdiac.ornl.gov/trends/emis/meth_reg.html

Q Dear Sir/Madam, I am interested in obtaining some archived daily temperature, humidity, and rainfall data for Beijing, Shanghai, and Taiyuan in China. Could you please advise if I can obtain this data from you, and how much it would cost? Thanks and regards, Anthony (2/1/10)

A Dear Dr. Anthony Horton, We appreciate your question to the CDIAC Web site. We do have some China data, but they are only daily for temp/precip and are not very recent. We have some monthly data too, again, not very recent, but I believe we do have RH. For all that we have please visit <http://cdiac.ornl.gov/epubs/ndp/ndp039/ndp039.html>. All the data you would want are probably available from NCDC, but unless you have access from a .edu, .gov, or .mil domain they may not be free of charge. Please see: <http://www.ncdc.noaa.gov/oa/climate/isd/index.php?name=isd-lite>. Sincerely, Dale Kaiser CDIAC

Q I'm looking for a public Domain Software tool to document the carbon footprint of a community. I don't want to pay for membership fees to do this for the City of Schenectady, NY. We have all kinds of energy data and we just need the formal public domain tools to document the footprint. (1/31/10)

A Mark, I am unaware of any public domain software that will accomplish your carbon footprint needs. Sincerely, Robert Andres

Q Hi, I am using CDIAC's fossil fuel CO₂ emissions data for one of my projects. When I downloaded the data from the UN Millennium Development Goals' website (<http://millenniumindicator.un.org/unsd/mdg/Data.aspx>) the total CO₂ emissions for the U.S. for the year 2002 (source: CDIAC) was reported as 5,694,198,000 tonnes (metric tons). However, the time series data which I got from CDIAC's website (<http://cdiac.ornl.gov/ftp/trends/emissions/usa.dat>) has the total emission for the U.S. for 2002 as 1,552,963,000 metric tons. I was wondering about the cause for the difference in the reported data although they are from the same source. I am sure I am missing something here. I would appreciate if you could clarify this doubt. I will look forward to your reply. Thanks very much! Tilottama (1/28/10)

A The data on the UN web site are reported in terms of the mass of CO₂. The data on our web site are reported in terms of the mass of the contained carbon. You can get from our values to theirs by multiplying by the ratio of the molecular masses = 44/12 = 3.67. You might also check the data vintage. You can do this by looking at the last year for which there is reported data. On our web site this is 2006 (we are working on 2007 now), I am not sure if the UN web site includes the most recent round of revisions (does it include 2006?). Gregg

Q We would like permission to use a diagram generated on your website in a report for a client and on the IEAGHG web tool when we update its content. The British Geological Survey are preparing a report on monitoring technologies which will be

permission using the reference below unless you would like to suggest alternative wording. Please can you reply using the text 'I confirm I am the copyright owner of this material [or authorised agent of the copyright holder where you represent an organisation] and that I consent to use of these materials for the purpose stated above with appropriate acknowledgement'. Please can you let me know if we can reproduce the diagram from this presentation by February 10th? CDIA WEBSITE 2009: Carbon dioxide information analysis center, environmental sciences Division, Oak Ridge National Laboratory, U.S. Department of Energy. <http://cdiac3.ornl.gov/las/servlets/constrain?var=98&var=118> Many thanks, Ceri (1/27/10)

A Dear Ceri Vincent, We appreciate your question to the CDIA Web site. The diagram that you would like to use in your publications is the Live Access Server (LAS), that was developed by NOAA PMEL group. The instance on CDIA page you referred to is outdated version that was developed for the GLODAP data search on CDIA web page. The GLODAP LAS will be updated soon, but we do not know when, to the new version with new, more advanced tools for the ocean data search. If you'd like to reproduce the graphic or figure which you made using the LAS, it would not be a problem at all, you just would need to mention in publication that this figure was made using the CDIA GLODAP LAS in the reference. Thank you, Alex Kozyr CDIA Sincerely,

Q When will the 2009 CO₂ data from Mauna Loa be available on your website? Thank you. (1/27/10)

A Dear Jim, Soon the 2009 Mauna Loa data will be available from our website. In the meantime, you might visit http://scrippsco2.ucsd.edu/sites/default/files/data/CO2_data/CO2_daily/mlocav.txt Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I have obtained a dataset of CO₂ emissions per country from CAIT (who apparently used figures from CDIA). My query is regarding the figures for Australia from 1851-1859, as the CO₂ emissions on these dates are stated as minus values. Would it be possible to give an explanation for how these figures were developed? A reference to a publication explaining this would be very useful if this is possible? Many thanks (1/25/10)

A Robert, Negative values can arise in a couple of ways. Obviously they are not reality, but they are indicative of the +/- on the emissions estimates and we have chosen to leave them in the data base when they arise. Estimates of CO₂ emissions derive from estimates of fossil fuel consumption and to get fossil fuel consumption we take production + imports and subtract exports and changes in stocks on hand. All of these are subject to some uncertainty, and especially in the early parts of this data set, we have sometimes relied on different sources of data, taking the best we could find from a variety of sources. The bottom line here is that if exports are reported to be greater than production, net apparent domestic consumption will be a negative number. Depending on what application you have for these numbers, setting them equal to zero is one good possibility. I hope this makes sense, but if you have a better idea how we ought to deal with this, we would be delighted to hear it. Fortunately this does not happen very often. Gregg

Q Hi: Where should I go to get accurate historical (I'm aiming for a range of now to 40 years back) temperature and precipitation numbers for El Paso, Texas? I thought I could easily find a graph or data table online, but no such luck..... Thanks for your time, Laura Kissack Laura Foster Kissack, Architect 2100 N. Stanton Street El Paso, Texas 79902? 915-867-2555 (1/25/10)

A Laura, our site has just what you need. Please see: <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> You can get graphs, download data, etc. for El Paso and 1200+ U.S. stations. Holler with any further questions. Dale Kaiser CDIA

Q <http://cdrg.ucsd.edu/articles.html/GasCalibration/> does not exist anymore.. Should be renewed or the hyperlinks from your site to the obviously important publication Keeling C.D., P.R. Guenther, G. Emanuele III, A. Bollenbacher, and D.J. Moss. 2002. Scripps Reference Gas Calibration System for Carbon Dioxide in Nitrogen and Carbon Dioxide in Air Standards Revision of 1999 (with Appendix and Addendum). SIO Reference Series No. 01-11. should be changed appropriately. Best regards, Jenik Hollan, <http://amper.ped.muni.cz/gw> (1/25/10)

A Jenik, It is almost impossible to keep up with URLs, but Google makes it easy. I started with "SIO Reference Series No. 01-11" and did a Google search. Then I selected "Advanced search" and limited the search to the scrippsCC₂.ucsd.edu domain. The first page in the search results has a link to: http://scrippsCC2.ucsd.edu/publication/refgas_report_2002.pdf, which is the paper you are looking for. We will update our links soon. Regards Fred

Q I am on a personal quest to find global warming. I have graphed local rural station temperatures for the past 100 years and there is no rise in temperature. There is certainly no hockey stick! City's are rising, yes, from UHI. What is the scientific evidence that .035% atmospheric CO₂ drives temperature? Hopefully it isn't the IPCC 2007 report, which is now proven to be deep in fraud. Thank you in advance for any scientific justification (1/24/10)

A Dear Ben, We appreciate your question to the CDIA Web site. And we would urge you to reconsider your assessment of the IPCC report. IPCC is the best way that all the objective climate research taking place around the world can be summarized. All the input to the IPCC reports come from the peer-reviewed literature. Our "peers" who review submissions to the literature do not have political agendas. They are passionate about solid, objective science. We are not in it for fame or fortune. I can assure you, but for our love of climate-related scientific studies. Consider the scientific background, qualifications, funding, and in some cases the

political agendas of those who are seriously at odds with the findings published by IPCC. A few specifics - The UHI effect has been addressed in the temperature databases discussed by IPCC through many years of research into this well-known effect. - While the term "global warming" in some senses is not ideal, it is useful to keep in mind what we mean by "global" - we mean a carefully calculated average over the globe. Not all regions have warmed of course - Some areas have warmed a lot (e.g., most of the Arctic) and are expected to continue to warm and there are and will be significant effects - most of them not good. Sincerely Dale Kaiser CDIAC

Q First let me thank you for your excellent detail of historic CO₂ emission data. My question refers to the unit of measurement. Do the amounts mentioned refer to pure carbon (C) or to carbon dioxide (CO₂)? Since CO₂ weighs 3.667 times as much as pure C. (1/23/10)

A I am pretty sure that we are completely consistent and always give numbers only for carbon. Gregg

Q Excuse me for asking a third question today. I compared the carbon emissions of the CDIAC data for the US and Canada together (around 5 mt/cap) with the corresponding data published in figure 2.2 of the Synthesis Report of the IPCC's 4th Assessment Report (around 26 mt/cap). I suppose this fivefold difference depends on certain preconditions. Can you explain to me please on which precondition this difference is based? Kind regards Hans (1/23/10)

A The number in the IPCC report is the total for all greenhouse gases. The number in our table is only for CO₂ emissions from fossil fuel use. Also, our number is in carbon whereas the IPCC number is in CO₂ equivalents. So multiply our number by 3.67 to get into CO₂ equivalents (about 18.5) and the remainder is all other greenhouse gases plus CO₂ from land-use change. Gregg

Q In your FAQ, it is stated, "Atmospheric CO₂ concentrations rose from 288 ppmv in 1850 to 369.5 ppmv in 2000, for an increase of 81.5 ppmv, or 174 PgC. In other words, about 40% (174/441.5) of the additional carbon has remained in the atmosphere, while the remaining 60% has been transferred to the oceans and terrestrial biosphere. The 369.5 ppmv of carbon in the atmosphere, in the form of CO₂, translates into 787 PgC, of which 174 PgC has been added since 1850. From the second paragraph above, we see that 64% of that 174 PgC, or 111 PgC, can be attributed to fossil fuel combustion. This represents about 14% (111/787) of the carbon in the atmosphere in the form of CO₂." As it relates to the 1959 article in Science News, which states, "A 25% increase in the amount of carbon dioxide in the earth's atmosphere during the 150-year period ending in 2000 A.D. has been forecast." My question is: what was the actual percentage of increase from 1850 to 2000 (in layman's terms)? Thank you very much, Carol Childress (1/23/10)

A I would divide the increase from 1850 to 2000 (369.5 - 288 = 81.5) by the value in 1850 (288). Thus 81.5 divided by 288 = 0.283. Multiplying by 100, this is 28.3%.

Q A number of writers on the web have quoted an October 2000 report 'The Important Greenhouse Gases' by the US Department of Energy. They quote a table which suggests that only 11880 ppb of CO₂ has been added by man - or 3.2% of a total 368,000 ppb. I can't track down or verify this source, and the figures seem implausible to me. I am grateful for your assistance. Dr Kevin Parker KKI Associates Edinburgh (1/22/10)

A Kevin: I sure can't find it! I will be ask a guy I know at DoE TJ Blasing

[and from Gregg] I do not know what the report is, but I can explain the numbers. The concentration of CO₂ in the atmosphere (in 1999) was 368 parts per million (=368,000 parts per billion), as measured at Mauna Loa Observatory in Hawaii. The total amount of CO₂ added to the atmosphere from burning fossil fuels in the single year of 2000, as estimated by us, was 6,735 billion metric tons of carbon = 24,717 billion metric tons of CO₂. To convert billion metric tons of carbon to what that would amount to as increased concentration in the atmosphere in parts per million, divide by 2.13, to get 11,604 ppm = 11,604 ppb, which is essentially the same as 11,880 as estimated by someone else. So, if all of the fossil fuel derived CO₂ released in 2000 stayed in the atmosphere, the concentration in the atmosphere would have increased by 3.2%. In fact something on the order of half stayed in the atmosphere at the end of the year and half ended up in the oceans or plants. Cheers Gregg

[finally from TJ] Aha! Thanks to Jim Kidder of our ORNL Library staff. The material on page 1 will probably be familiar to you; the web address is given in case you want to see how it was presented on the site. Water Vapor Rules - AQ Global Alliance, Inc. The material on the 2nd page is from their reference 1, which happens to be my web site. If you can figure out how they got their table from my table, please let me know. Cheers T

[TJ] attached "Distortion 1.pdf" which contained the table]

Q how much exhaust gas component will we get after burning 1 litre petrol in a bus? (1/21/10)

A Ovi: You didn't specify whether you wanted mass units or volume units. I will give you the mass units. About 2.4 kg will be carbon dioxide (0.65 kg-carbon) and about 0.9 kg will be water vapor (0.1 kg hydrogen); that is most of it. However, the remainder depends on a number of factors such as how often the bus was idling, how well the engine is maintained, the additives in

the fuel, how much of the fuel is biofuel I was assuming distillate fuel, no biofuel, and a well maintained bus not idling vary much. [http://www.opticsinfobase.org/DirectPDFAccess/\\$525EAF8D-BDB9-137E-C8288AFEAE5A5F7A_122799.pdf](http://www.opticsinfobase.org/DirectPDFAccess/$525EAF8D-BDB9-137E-C8288AFEAE5A5F7A_122799.pdf) da=1&id=122799&seq=0 Can provide you with more information on the composition of distillate fuels. TJ Blasing

Q I'm doing a project can you explain about CO₂ that plants animals volcanos and ocean release im arguing that the earth is the main global warming cause.....can you help? (1/21/10)

A Hi Gabby, This will be a tough sell since fossil fuels used by humans and not Mother Earth are the reason for the rise in atmospheric CO₂ levels. Mother Earth is the main regulator of the carbon cycle. To respond more directly to your question..... Plants--> plants take up CO₂ during photosynthesis and respire CO₂ at night and when dormant. In many areas, including the US, plants are actually taking up more carbon than they are releasing. Oceans--> Globally the oceans are storing more carbon right now than they are releasing. Volcanoes--> Short-term volcanoes can emit sizeable amounts of carbon to the atmosphere but these infrequent inputs are dispersed and taken up by plants and the ocean pretty quick (within 1 year). Hope this helps. Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q How do i open your digital data files? and Do you have CO₂ emission data for india for different industries or states or by any other category? Please tell me the link for the same. (1/21/10)

A Dear Sachin, To open the data files simply click on the words "Digital Data". If this fails please notify me and I will send you the India emission estimates as an e-mail attachment. I regret we do not have finer resolution emission estimates for India besides those provided at http://cdiac.ornl.gov/trends/emis/tre_ind.html. I suggest you contact energy research groups within India about detailed emission reports (e.g., Tata). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q In a typical sized classroom of 20-25 children, does the amount of CO₂ (in PPM) increase significantly from the CO₂ level when the children are not there (or have not been in the room at all)? (1/19/10)

A Hi Leslie, Thanks for your question. The simple answer is yes. Ambient concentrations are between 350-400 ppm. When students are present in the classroom the CO₂ levels could certainly rise above 1000 ppm with windows closed. This is good news (i.e., the kids are alive and breathing) and there is no reason for alarm since CO₂ is not toxic until it reaches ~60,000 ppm. I attach a spreadsheet with graphics to illustrate my points. We were testing a new CO₂ measurement system before deployment in the field during fall 2005. We set the system up in a first-floor room the size of a typical classroom. We had two graduate students working at desks in the room during the trial period. If you look at the graphs you'll see the peaks in CO₂ when the students were present (e.g., 10/7 & 10/8) and declines and returns to ambient levels when not present (e.g., the weekend of 10/9 & 10/10). You can also see when they turned on the air conditioning thus mixing the air (e.g., JD 285 or 10/12). We thought this was pretty cool and gave us real confidence in the sensitivity of these modern day CO₂ measurement systems. Thanks again for your question and please let me know if I can be of further assistance. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q There is plenty of documentation on trends in CO₂ concentrations and there apparent increase, however I have been trying to find data to show the ratios of CO₂, O₂ and N₂ over a similar period, to evaluate the trend data as the ratios should show change to support the increase in CO₂ concentrations. This data appears to be missing so throwing some questions into current theories. Any information would be much appreciated. (1/17/10)

A Hi John, Thanks for your question to our web site. You are correct that in order to get a complete picture of the atmosphere we need measurements of multiple species including isotopes and O₂/N₂ ratios. The links listed below will direct you to some of these key additional measurements in our archive and elsewhere. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory <http://www.youtube.com/watch?v=6WFCoJg71A> <http://cdiac.ornl.gov/ndps/alegale.html> <http://cdiac.ornl.gov/oxygenisotopes.html> <http://www.esrl.noaa.gov/gmd/hats/>

Q I come from China. First thank you for checking this mail. I write this for the purpose of getting some data of global emissions of Carbon Dioxide till 2009. I am writing a paper about global warming, but I didn't have some data to support my view. CDIAC is an authentic organization with great reputation; I'm sure your data will do me a great favor. So I really appreciate you if you could help me. Thank you! (1/16/10)

A We do not have global, fossil-fuel emission estimates yet for 2009. Our estimates are based on energy data assembled by the United Nations and reported by individual nations. The best we can offer now are preliminary estimates through 2008 and these estimates may be found at http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls. Good luck with your paper. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q First, do you have an approximation on how many billions of tonnes of carbon dioxide is produced annually worldwide AND if we could potentially cut several millions of tonnes of carbon dioxide per year. What effects would that have on Global Warming? At the above rate, how soon could we stop Global Warming and save the planet? (1/15/10)

A Dear Kerri, The latest global estimates of CO₂ releases from human activities may be found at the following links http://cdiacornl.gov/trends/emis/tre_glob.html http://cdiacornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls <http://cdiacornl.gov/trends/landuse/houghton/houghton.html> Model emissions scenarios, some resulting in reduced emissions and slowing the growth rate of atmospheric CO₂, are presented and discussed at http://www.grida.no/publication/other/ipcc_sr/?src=/climate/ipcc/emission/ Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear Sir, we are planning to measure CO₂ baseline concentration in ambient air. We are located in Qatar. We want to work with CO₂ related projects with other research institute. Please send us the CO₂ continuous analyser detail and other research ideas. regards Krishnasamy Raman Air Quality Specialist Qatar University (1/15/10)

A Dear KRISHNASAMY RAMAN, We appreciate your question to the CDIAC Web site. Greetings. Our group does not actually measure CO₂. We are a data, analysis and information center. It might be best to start here: <http://scrippsCC2.ucsd.edu/home/index.php> Regards, Dale Kaiser CDIAC

Q I am conducting some research looking at the potential for CO₂ EOR in Libya and I am struggling to find the CO₂ emissions data for individual Power Stations in Libya... Can you help or point me in the right direction please!!!! Regards..joe (1/15/10)

A Joe, I have not worked with this data set, but www.carma.org claims to have data on global power plants. You might also take a look at the Emissions Database for Global Atmospheric Research (EDGAR), which can be found in Google. Good Luck, Gregg

Q I'm trying to establish the half life of CO₂ and I've come across figures that vary from as low as 5 years to as high as 500 years. Q1. Why such discrepancies on such a crucial piece of data? Q2. Can you tell me the correct figure? (1/15/10)

A The values differ because 1.) they depend on how you functionally define half life, 2.) because you can't really measure this so you have to model it mathematically and there are different models that are used, and 3.) because of the nature of the global cycling of carbon, the half life depends on how much CO₂ you are talking about. In a short space here I can tell you why the huge range and then refer you to a short article that explains in detail. If you take one molecule of CO₂ in the atmosphere it mixes continually between atmosphere, dissolved in the ocean, and taken up by plants- and back to the atmosphere. If you ask how long does it stay in the atmosphere on average, the answer is something on the order of 5 or 6 years. If, on the other hand, you take a large mass of CO₂ and add it to the atmosphere and ask how long will it take before the concentration in the atmosphere relaxes back to half of the original addition, this is a very different question and the time is very much longer- and to estimate this we need models of all of the things that happen to carbon atoms circulating in the atmosphere, biosphere, oceans, etc. Attached here is a paper written some years ago that tries to explain how this works and what answers you will get. If you can read and understand this paper that is swell, but you can get the information you want by reading the abstract and looking at Figure 14. Figure 14 shows how the concentration in the atmosphere changes as you inject a large quantity of CO₂ into the atmosphere and then watch this quantity decay back toward its initial value. One obvious observation is that it decays very quickly initially but never gets all of the way back to the starting point. You will see that it is back to half of the injection in something like 50 to 100 years, depending on the mathematical model that you think best represents the real Earth. Cheers, Gregg

[Gregg attached a PDF file of "The lifetime of excess atmospheric carbon dioxide" GLOBAL BIOGEOCHEMICAL CYCLES, VOL. 8, NO. 1, PAGES 23-38, MARCH 1994]

Q what are the properties of carbon? why cannot we change carbon into O₂ (1/13/10)

A I do not mean to be dismissive, but the information you are looking for is the subject matter of basic chemistry and I think your best bet is to read a couple of short articles on basic chemistry. Since you are writing to us you have access to the internet and I suggest you go to the Wikipedia pages on "chemical element" and "carbon". Our best, Gregg

Q From a few research articles, I have found that there are certain heavily traveled highways that have current CO₂ levels around 1200 ppm next to them. I live in the DC area and was wondering if there is any data on these roads and the CO₂ concentrations recorded around them. I am looking for one of these areas to conduct an experiment at, but I need the preliminary data. Do you know who I should contact? Thank you, Cassandra Smith (1/13/10)

A Casandra, I am not able to answer your question directly but can offer a lead that may be useful. One of the long term CO₂ monitoring sites in an urban environment is in Baltimore- the Cub Hill Site. Current scientific leader for the site is John Hom at the US Forest Service jhom@fs.fed.us. There is also a lot of urban data, with enough to show the diurnal cycle of traffic, for Salt Lake City. I am not sure of the current status of this work but Diane Pataki, now at UC Irvine, was much involved in the past. Best

of luck, Gregg

Q do plants turn from CO₂ to O₂ at night (1/10/10)

A Amber, The conversion of oxygen to carbon dioxide occurs only during daylight hours. This is because sunlight is required for the chemical reaction to take place. Sincerely, Robert Andres

Q If there are 75 Million Family owned primary residence, How much carbon would be reduced if they all had 2KWH of Solar installed on the roof? Is the current tax credit of \$500 per 0.5 KW enough to stimulate Green Jobs and major installs? (1/10/10)

A Todd: I may be able to help with the first question, but the second involves politics and economics, in which areas your guess is at least as good as mine. In the U.S., on average, about 680 grams of carbon dioxide are released per kWh of electricity delivered to customers. This is a current average, it includes everything from hydropower to coal-fired power plants. If you mean that 2 kWh is an ACTUAL average figure, then $2 \times 680 \times 8766$ hours in an average year (including leap years) = 11.92 Mg (almost 12 metric tons) of carbon dioxide is saved per household. $12 \text{ Mg-CO}_2 \times 75,000,000 = 900 \text{ Tg-CO}_2/\text{yr}$ or around 15% of the nation's total fossil carbon dioxide emissions (a Tg is a million metric tons). If you mean NOMINAL power, then you can divide those figures by 4 and put in a cloud-cover adjustment to reduce the savings even further. Finally, adjust for how much fossil energy (and carbon emitted) it takes to make the solar units. Which will further reduce the carbon savings somewhat. Well, it should be clear by now that there is no single solution to reducing the CO₂-emissions, but there is general agreement that solar cells would help a lot. TJ Blasing

Q This web site http://www.geocraft.com/WVFossil/greenhouse_data.html Makes these statements: Man-made and natural carbon dioxide (CO₂) comprises 99.44% of all greenhouse gas concentrations (368,400 / 370,484). Anthropogenic (man-made) CO₂ additions comprise (11,880 / 370,484) or 3.207% of all greenhouse gas concentrations. Total combined anthropogenic greenhouse gases comprise (12,217 / 370,484) or 3.298% of all greenhouse gas concentrations. And give this url for your site as the source: http://cdiac.esd.ornl.gov/pns/current_ghg.html I just cannot find anything stating these figures here or anywhere else. Are these figures correct? I asked the author but they appear to be too busy to respond. Thanks Mike Williams (1/10/10)

A Dear Mike Williams, We appreciate your question to the CDIA Web site. Anthropogenic CO₂ is a little over 100 ppmv and the total is about 390 these days, so somewhat over 25% of the current CO₂ is anthropogenic. Additionally, some of the numbers you give may apply to actual concentrations, but most greenhouse gases are more effective than CO₂ on a molecule by molecule basis, so that actual concentrations are not good indicators of changes in greenhouse effect. Sincerely, TJ Blasing

Q I am looking for studies which examine the CO₂ values in ice and compare that against CO₂ values in air, for comparable time periods. Would you please advise me of the availability either at your center, or elsewhere? Thank you for your time and attention to this matter. M Hieb (1/9/10)

A Dear Monte Hieb, For the "preindustrial" time period (prior to about 1900) the CO₂ concentrations derived from a few measurements at the time, from later measurements of CO₂ preserved in airtight objects, and as derived from some ocean-water data at depth suggest that 280 ppmv was a pretty consistent value. In such a case the value will come up as 280 ppmv for any ice-core data more than about 100 years old, at least until you get back to glacial times. After about 1900, CO₂ was increasing so the ice-core data should begin to show an increase. All this is indeed the case, and the ice-core values match the atmospheric values quite well. See: <http://cdiac.ornl.gov/trends/CO2/lawdomedata.html> Some "leads" into the literature are given at that site. Of course, air diffuses through the ice layers for a number of years before they become "airtight" so to speak, so we have to wait to compare the very recent measured atmospheric CO₂ values. Sincerely,

Q THERE DOESN'T SEEM TO BE ANY REAL TIME GLOBAL ESTIMATE OF CO₂ ATMOSPHERIC VARIATION (SAY PPM) MONTH BY MONTH. ISN'T ANYONE MONITORING SUCH CHANGES? (1/8/10)

A Did you find this part of our web site? <http://cdiac.ornl.gov/trends/CO2/> There are stations all over the world making such measurements and some of the data is tabulated here. The challenge may be your statement about real time. Measuring CO₂ is not like measuring temperature and it takes time to calibrate and check data so there is generally a couple of months lag between measurement and posting on the web. What they want to know is the background CO₂ level in the atmosphere, not what it looks like in the air downwind from a power plant. Imagine trying to measure outdoor temperature while standing in your garage door - it takes time and care to sort out the data. Gregg

[Richard responds] Dear Dr Gregg Comes of trying to do several things at once! Not real time monitoring sorry, but I'm looking for something like the Keeling graph for 2009, to see the global CO₂ ppm monthly trend. The Scripps graphs have the right spread but are too small scale ... over several years ... to see monthly trends, so I wondered if CDIA had such data. Frustratingly my PC refuses to download the Keeling graph! Can't see anything on your website although individual monitoring station data are available, although again too small scale. I am surprised that such global monthly trends in atmospheric CO₂ are not more visible on your website (if there at all) because such data is surely of primary public interest. My interest? Trying to correlate CO₂ global

Q What is the effect of heat radiated from engines to the atmosphere in global warming putting in mind the level of inefficiency of current engine technologies (1/6/10)

A Hi: About 100×10^{12} kWh of energy are provided to the world by fossil fuels, hydropower etc. in a year. Most of this is from fossil fuels. Dividing this by 8766 hours in an average year (including leap years) gives $100,000 \times 10^9$ kWh / 8766 = is roughly 11×10^9 kW, or 11×10^{12} Watts. The surface area of the earth is about 500×10^{12} square meters, so the radiative forcing is about 20×10^{-3} W/m², or 0.02 W/m². Roughly half of this is from engines depending on how you define "engine". So about 0.01 W/m² are due to engines, this is less than 1% of the radiative forcing due to CO₂. You can compare this radiative forcing with other components of global warming given in figure SPM.2 of http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf Sincerely, TJ Blasing

Q could you explain the concentration of carbon dioxide (levels) in atmosphere during ice age? what are the factors that caused this level? (1/6/10)

A The attached short article provides some discussion that you should find useful. Gregg

[Gregg attached a PDF of the review article: Daniel M. Sigman & Edward A. Boyle, Glacial/interglacial variations in atmospheric carbon dioxide, Nature Vol. 407, pp. 859-869 (19 October 2000)]

[The colors in the PDF are awful]

Q Dear Sirs, I appreciate your help regarding the calculations procedures used to estimate CO₂ emission per country (as seen in data information you published in <http://millenniumindicator.un.org/unsd/mdg/Home.aspx>) Thanks, Marten Solar M. (1/5/10)

A Dear Martin Solar Monsalves, We appreciate your question to the CDIAC Web site. These CO₂ data are presented on our site also, along with references to all papers that detail the procedures you wish to learn about: http://cdiac.ornl.gov/trends/emis/overview_2006.html Sincerely, Dale Kaiser

Q I am looking to do a research project for a masters using CO₂ emissions per country. I have received a dataset back to 1971 with CO₂ emissions from each country for each year. The source that I downloaded this from (IEA) recommended contacting CDIAC to see if there is a database of recorded/estimated emissions per country back beyond this. Ideally I would like data back to 1850, but any extra figures beyond 1971 would be extremely useful (1/4/10)

A http://cdiac.ornl.gov/trends/emis/meth_reg.html Starting from this site you should be able to find emissions numbers by country for 1751 to 2008. Happy New Year, Gregg

Q One of your estimates is that the use of a certain home electrical appliance for three hours is responsible for the production of three pounds of carbon dioxide. Define a pound of carbon dioxide. Give me a 'visual'. Is it a cubic foot? A cubic yard? Can I put it in my pocket or do I need a warehouse? Thanks, Dick Sanders (1/4/10)

A Good question. We should probably add it to our FAQ. Anyway, one would use the ideal gas law to compute this: Pressure = density \times R \times T where R is the "gas constant" - http://en.wikipedia.org/wiki/Gas_constant density is mass divided by volume. Here is an example calculator to plug things in and use this relationship <http://www.chemicalaid.com/tools/idealgaslaw.php> I haven't checked the math but am assuming it's correct. If you plug in 1 "atm" (std. atmosphere at sea level), 1 pound, and a temp of 20C (68F) - "room temperature", you get about 8.75 cubic feet. CO₂ is heavier than air, as you can see if you plug in "air" instead. Thanks for your question Dale Kaiser CDIAC

Q Dear CDIAC I have been comparing CO₂ concentrations as measured at Mauna Loa and the South Pole Station. Could you please advise your understanding of the near straight line increase in difference in reported CO₂ concentrations between the data sets from 1958 to 2007. Differences at the end of the 50s was around 0.5 ppm, rising to over 3 ppm in 2007. Advice will be much appreciated (1/1/10)

A This is probably because most of the fossil CO₂ emission occurs in the northern hemisphere and has been increasing. Lianhong Gu

Q Could you kindly point me to a temperature record for circa 1960 to the present for the Amundsen Station or its nearest neighbor? I have already examined the data at: <http://cdiac.ornl.gov/ftp/ndp032/table2.txt> but desire to locate an alternate

dataset, preferably one that references absolute temperature. Thank you very much for your time and attention to this matter. Best regards, Monte Hieb (12/30/09)

A Dear Monte Hieb, For the "preindustrial" time period (prior to about 1900) the CO₂ concentrations derived from a few measurements at the time, from later measurements of CO₂ preserved in airtight objects, and as derived from some ocean-water data at depth suggest that 280 ppmv was a pretty consistent value. In such a case the value will come up as 280 ppmv for any ice-core data more than about 100 years old, at least until you get back to glacial times. After about 1900, CO₂ was increasing so the ice-core data should begin to show an increase. All this is indeed the case, and the ice-core values match the atmospheric values quite well. See: <http://cdiac.ornl.gov/trends/CO2/lawdomedata.html> Some "leads" into the literature are given at that site. Of course, air diffuses through the ice layers for a number of years before they become "airtight" so to speak, so we have to wait to compare the very recent measured atmospheric CO₂ values. Sincerely,

Q Hi, I got your email from the ushcn website. I am trying to understand better the nature of the adjustments applied to the data. It seems from the website that adjustments can be made for TOB, station relocation, UHL, or other things identified in the station metadata. Then adjustments can also be made for undocumented reasons. The Fairmont station has been at the same location since 1931 and TOB has changed only once, from 0700 to 0600. Extracting TMAX from the daily data shows a big jump in the annual average tmax from 1995 to 2008 - 11 annual averages more than one standard deviation from the mean, and 4 observations almost 2 standard deviations from the mean. Clearly something happened with the measurements. The ushcn monthly data, which reflects NOAA's adjustment, shows an upward adjustment of about 3 degrees F starting April 1931 and dropping suddenly to near zero at March 1994. Nothing in the station metadata indicates why such an adjustment would be necessary. Does anyone know why this particular adjustment needed to be made? Or if it's a purely algorithmic adjustment, is there a document that describes the algorithm? (12/29/09)

A Hi James, Thanks for your email. For questions as detailed as yours, I must refer you to the USHCN compilers at NCDC, whose names are here: <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> As I think you realize, the daily USHCN data have not been adjusted at all, although they do have quality flags assigned to the daily values. This is where the latest algorithms for adjustment come into play in computing the fully adjusted monthly means. The most detailed sources that I know of regarding the USHCN adjustment algorithms are the J. Climate and BAMS papers of Menne et al. here: http://cdiac.ornl.gov/epubs/ndp/ushcn/monthly_doc.html#references Regards, Dale Kaiser CDIAc

Q Dear Sir/Madam, I am doing a research about environmental research centres and would like to know roughly how many people you are, if at all possible. Kind regards, Rossana Barreto, Architecture student Greenwich University London (12/27/09)

A Here (attached) is an organizational chart. My group is in the middle of the 3rd column. TJ

[TJ] attached the July 2009 ESD.org chart.pdf

Q I wish to enquire about disaggregated data for CO₂ according to economic sectors. Do you have quarterly CO₂ data? I need this for my research on the Economics of Climate Change. (12/24/09)

A Jasmine, we do not have CO₂ data by economic sector. The International Energy Agency in Paris does have some CO₂ data in broadly aggregated sectors. Are you looking for quarterly data by sector or just quarterly data on total emissions? Do you want quarterly data for some countries, all countries, or for the global total? We have been working very hard to assemble emissions data by month (without sectoral separation) and some of this data could be made available and some has been published. Gregg

Q When fresh snow containing atmospheric air is laid down it is reasonable to assume that the gas content of that air is representative of the atmosphere at that time. But I would like to know what work has been done on the effects of cosmic rays passing through the ice over extended periods. The flux of secondary cosmic rays at the surface of the Earth could penetrate into the ice and cause chemical composition changes. So is this effect taken into account? (12/23/09)

A Peter, Not my specialty, but I can offer some information regarding your inquiry. Yes, when snow falls it traps some of the ambient air in pockets between the snow crystals. Over time, if these crystals get compressed that air is trapped in bubbles in the resulting snow/ice mixture. However, that trapped air does not only contain air from the time of first snow fall. Rather, there is a period of time during which there is still exchange with the atmosphere. That period of time is different for different sites and is affected by snow fall rate, temperature, snow/ice composition, amongst other factors. I recall reading about air exchange times ranging from a few years to decades. As for your second question, I am unaware of any studies regarding cosmic ray flux and air composition. Sincerely, Robert Andres

Q I use UNFCCC emissions (w/o LULUCF) for Annex 1 countries but look at CDIAc Trends measures for other countries to get a sense of comparative changes in emissions and intensities (using UN economic data to derive the latter). When I compare CDIAc trends data to UNFCCC measures for Canada, for example (base 1990) there is a major difference in growth. Assume reasons

are complex, but can you simplify, or should I treat your non-Annex country measurements as a very rough approximation to what would be the case if the country were measured by UNFCCC standards? (12/19/09)

A We calculate CO₂ emissions from energy data from the United Nations, using methods that are essentially the same as those used by the countries in their national reports. We do a lot of quality assurance checks on the UN data and notify them when we find data problems, but basically we stick with the UN reported data. In theory we should get very similar numbers and similar trends as the countries report. Two important differences are that the countries can use more country-specific coefficients where we are inclined to use global-average values, and the countries are more knowledgeable on their own circumstances and thus more likely to recognize data problems. In reference to your specific inquiry, we have indeed had some recent data problems in Canada. Had you looked at our data file one year ago you would have found even larger problems. A year ago we had a major problem with the numbers on emissions from liquid fuels but I thought we had found and fixed most of that. There remain some problems with the data on natural gas from the mid 90s that we have not known how to fix. We are just starting on a full revision of the data that will include an update to 2007 (we have just received the updated primary energy data from the UN) and we are hoping that they will have made refinements in the natural gas data. We appreciate your alert and will watch the data from Canada closely. We like to think that our estimates are better than a rough approximation. Gregg

[response from Carl] Thank you very much for your time and the explanation. I am not so concerned about Canada as more generally, I am using the CDIAC estimates to fill in non-Annex 1 countries and want to have some confidence that your approximations are well founded. Your reply provides that confidence. Re Canadian data, I can think of several sources for you, but as a starting point, if you want help with Canadian energy data, you might start with Hertsel Labib (Director, Analysis & Modelling Division, Energy Policy, Natural Resources Canada, NRCAN (613) 995-8762, hlabib@nrcan.gc.ca). Alternatively, the Office of Energy Efficiency at NRCAN has primary responsibility for historical energy data, and I can provide you references there if that would help. Again, thanks for taking the time. Have a happy holiday -- Carl Sonnen Informetrica Ltd. Mailing Address: P.O. Box 828, Station B Ottawa, Ontario K1P 5P9. Courier Address: 176 Bronson Avenue, K1R 6H4. Tel: 613 238-4831 ext. 2229. Fax: 613 238-7698. Home Page: <http://www.informetrica.com>. Due to the present economic climate... the light at the end of the tunnel has been switched off.

Q I would like to know if the following indicator "carbon dioxide (CO₂) measured in thousands of metric tons of CO₂ (CDIAC)" (available in <http://millenniumindicators.in.org>) is meant to express a direct measure of CO₂; or instead is it used to reference the whole emission of gases of greenhouse effect expressed as CO₂. Respectfully, Martin Solar. (12/18/09)

A Dear Martin Solar M., We appreciate your question to the CDIAC Web site. Yes, these numbers are just CO₂ - no other greenhouse gases included. On the CDIAC website we express emissions in terms of the mass of carbon in the CO₂. The molecular weight of carbon is 12, oxygen is 16, so one CO₂ molecule is represented as 44. $44/12 = 3.666...$ So the numbers on the UN page you refer to are the result of multiplying our carbon numbers by 44/12, which is fine since they say CO₂, not C. Related to this, see this FAQ: <http://cdiacornl.gov/faq.html#Q9>. Also see our page at: http://cdiacornl.gov/trends/emis/overview_2006.html for all methods involved. Sincerely, Dale Kaiser

Q I've read that the wavelength that Carbon Dioxide can absorb becomes saturated very quickly (10 meters at the 12.5 micron wavelength for current CO₂ concentration of 0.0385%) and that by doubling the concentration, this saturation distance will be cut in half. Also, along these lines, I've read that the wavelength that CO₂ can absorb are already completely saturated and that, essentially, increasing CO₂ concentrations will not cause any significant increase in trapped IR energy, but merely cause some IR energy to be trapped sooner (lower in the troposphere). Is this scientifically agreed upon? (12/16/09)

A Dear Jesse Reich, We appreciate your question to the CDIAC Web site. Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/>. And of course, there are the latest IPCC reports: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>... radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Dale Kaiser, CDIAC

Q When will the next CDIAC report on world CO₂ emissions come out (I understand the last one was in 2007, for 2006)? Thank you, Ben Upham (12/15/09)

A On our web site you should find completed data through 2006 and preliminary data for 2007 and 2008. Completed data for 2007 should be available by April or May and preliminary data for 2009 will be available around the end of June. Gregg

Q Hello CDIAC From a chemical perspective why is methane more potent greenhouse gas than CO₂, seeing that it has a shorter atmospheric lifetime? What makes it able to absorb more infrared than CO₂? Are there differences in their vibrational modes which allows this? Thank you please contact me by email as soon as you possibly can! (12/15/09)

A Hi, Grace. For one thing, methane absorbs in wavelengths where "nothing" else absorbs except water vapor, and it absorbs near the edges of the water vapor bands where radiative saturation is not 100%. Hope this is clear. TJ

Q How much carbon is emitted into the atmosphere yearly? (12/15/09)

A Aisha The answer depends to some extent on what year you mean, and how many volcanos and forest fires occurred in that year. Additionally the fossil carbon component is now a factor as it has increased to about 30.5 GtCO₂ (billion metric tons) of carbon dioxide in 2008. Because I don't know what processes you would like me to include when I add up the total, I recommend you have a look at Figure 7.3 in: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf which gives the components of the global carbon budget, including biospheric and oceanic releases and uptakes. Then you can see the fluxes and the net values. These are approximate values for the 1990s, and they represent carbon only. To get carbon dioxide, multiply by 3.67. Thus the 6.4 given in the figure has now increased to around 8.3 (fossil fuels only, not counting carbon from cement manufacture), and now represents $8.3 \times 3.67 =$ about 30.5 billion metric tons of carbon dioxide in 2008. See: http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls and For the breakdown on fossil carbon-emissions by fuel and cement manufacture. According to my children, if you ask me the time of day I will tell you how to make a watch. I may have given more information than you wanted, but I would rather do that than not give enough. TJ Blasing

Q I would like to be able to contact angus maddison with reference to a graph comparing CO₂ with gdp which was used by martin woolf in the financial times dec 19 2007 i am a writer re relationship between energy and money (12/14/09)

A Sorry, we do not have any personal connections with Professor Maddison. We would start pretty much the same as you would - Google. Gregg

Q CDIAC, I am currently working on a climate research project. I am searching for original data for CO₂ emissions. The data set found at http://cdiac.ornl.gov/trends/emis_mon/stateemis/emis_state.html are "Estimates of Annual Fossil-Fuel CO₂", but what I would like to locate are actual calibrated instrument measured data sets. Am I over looking those data sets or if not available on your sight would someone at CDIAC please steer me in the right direction to find that type of data set? Thank you for your assistance. John Judson University Student (12/14/09)

A You are searching for something that does not and can not exist. CO₂ emissions are estimated based on the amount of coal, oil, and natural gas that are burned throughout the world. Gregg

Q I am doing a statistics project which uses the information from your website and I need to cite where your data is collected from and how. I've been searching the website and I cannot find the answer. Could you please let me know asap. Thank you (12/10/09)

A Hi Saskia, The sources and methods for our fossil fuel estimates are provided on our website at http://cdiac.ornl.gov/trends/emis/overview_2006.html. Please let me know if you need additional details. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[from TJ Blasing] Saskia: Let me know which data you refer to and someone can direct you accordingly. TJ Blasing

[more from TJ] Tom Boden has already replied for the emissions data. <http://cdiac.ornl.gov/trends/CO2/sio-mlo.html> Provides the information for the concentration data from the Scripps Institution of Oceanography <http://www.esrl.noaa.gov/gmd/>. Gives more detailed information than we summarize, so you may want to go directly there for the NOAA CO₂ concentration data. TJ Blasing

Q Can you send me a graph of the IR spectrum of carbon dioxide in the climatographically relevant range (i.e. including the 14 micron line)? (12/10/09)

A Dear George Pender, Not in this e-mail format, but if you send me an e-mail at: blasingtj@ornl.gov I can reply with an attachment. Sincerely, TJ Blasing

Q Hi, Two questions. 1. I found the list of top 20 useful, but a list of the top 50 would be more helpful for me in devising a program for UNIDO technical cooperation. Is such a list available or how can I generate it? 2. I was surprised that you had data on CO₂ emissions for cement. I say this because my current project is in Vietnam for which I have not been able to find any subsector data. Where did you find the data? Thanks. R. Luken (12/10/09)

A Ralph 1.) We do have a list of ALL countries in descending order of emissions for 2006. I thought it was on the web site but I can't find it either so I am asking Tom Boden to pass it along to you. 2.) Our data for cement are the CO₂ emissions from the

calcining of limestone; they are not the emissions from the fuels used for cement production. All of our cement estimates are based on cement production data collected by the U.S. Geological Survey.

Q Dear receiver, I am looking for data about the total stock pollution of the OECD countries from about 1850, like the total amount of CO₂ those countries produced. I need those information for a research paper on climate change. Would be great if you could help me as I couldn't find anything on the net so far. Best from Germany Burkhard Wilmes (12/9/09)

A Dear Dr. Oliva, Your question regarding AOD data for Mexico was forwarded to me. Thanks for your interest in CDIAAC data products. However, CDIAAC does not archive AOD data. Your best source for this data will be the MODIS Aerosol Product that can be found at http://modis-atmos.gsfc.nasa.gov/MOD04_L2/index.html. When you start to order the files through LAADS WEB, you'll be looking for level 2 products. Good luck, Les Hook

Q How much CO₂ is released into the air every year? (12/9/09)

A Johanna The answer depends to some extent on what year you mean, and how many volcanos and forest fires occurred in that year. Additionally the fossil carbon component is now a factor as it has increased to about 30.5 GtCO₂ (billion metric tons) of carbon dioxide in 2008. Because I don't know what processes you would like me to include when I add up the total, I recommend you have a look at Figure 7.3 in: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf which gives the components of the global carbon budget, including biospheric and oceanic releases and uptakes. Then you can see the fluxes and the net values. These are approximate values for the 1990s, and they represent carbon only. To get carbon dioxide, multiply by 3.67. Thus the 6.4 given in the figure has now increased to around 8.3 (fossil fuels only, not counting carbon from cement manufacture), and now represents $8.3 \times 3.67 =$ about 30.5 billion metric tons of carbon dioxide in 2008. See: http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2007_2008.xls and For the breakdown on fossil carbon-emissions by fuel and cement manufacture. According to my children, if you ask me the time of day I will tell you how to make a watch. I may have given more information than you wanted, but I would rather do that than not give enough. TJ Blasing

Q 1. Apparently each increment of CO₂ increase in the atmosphere produces less warming than the unit before it. Does a formula exist to calculate the effect? 2. "The amounts of CO₂ already added to the atmosphere may already be close to saturation levels". Is there such a thing as saturation for CO₂ in the atmosphere? Does it mean that beyond a certain level the additional warming effect fades to zero? 3. It appears that CO₂ levels may increase to 2000 ppm when all fossil sources would be burnt. Is there any way to calculate how that would influence global temperature? 4. Some 400 to 600 million years ago CO₂ levels were at 6000 to 8000 ppm. Do we know what the temperatures were on earth? (12/8/09)

A Dear Dr. Lutz Peters, We appreciate your question to the CDIAAC Web site. Before I address the points raised in 1-3, let me first ensure you know about IPCCs take on question 4: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_FAQs.pdf (p. 114) http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch06.pdf. With regard to CO₂ absorption/saturation, I insert a response to a similar question below and hope that it helps to some extent. Sincerely, Dale Kaiser ----- Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/>. And of course, there are the latest IPCC reports: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> ... radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Regards, Dale Kaiser CDIAAC On Wednesday 17 June 2009 08:20 am, you wrote: Hi, First let me say I found your website very informative and a great resource for understanding CO₂ and its impact on climate change. I have a question you might like to help answer as I am having trouble finding a clear answer on the internet. Is there any truth to the comments that atmospheric CO₂'s infrared absorption capacity (within its absorption bandwidth) is effectively reached at somewhere near 30 ppm (even though it is now near 400 ppm)? Also as an extension is there a logarithmic effect to absorption and its consequential effects? What are the implications of this type of scaling? Some arguing that CO₂'s effect on warming is effectively 99% already within its bandwidth range. I am not a skeptic but (okay that sounds a bit like a skeptic...) I do have questions still and I am intent on doing my own research on these matters. Any clarification would be greatly appreciated.

Q If SO₂ can be converted to H₂SO₄ why cannot CO₂ be converted to CaCO₃ (chalk). Sulphur dioxide was blamed for acid rain - so it is now turned into sulphuric acid. This acid plus phosphorous rock is made into a fertiliser - "Super". Maybe there is nothing we can do with calcium carbonate but, perhaps, it is less of a problem than CO₂? Bernard Duke Launceston Tasmania Australia Spud199@hotmail.com 8th Dec 2009 (12/8/09)

A Dear Bernard, While I'm not the chemist in our group, I suspect that the answer to your CO₂ conversion question lies in the energy details of the conversion. Like many other ideas that have been raised, the process may require significant energy (see, e.g., FAQ 22 here <http://cdiac.ornl.gov/faq.html>), and where does most of our energy come from still? Combustion of fossil fuels.... and therefore the emission of still more CO₂. Regards, Dale Kaiser CDIAAC

Q CO₂ can only absorb energy in certain specific wavelengths (or narrow bands around those key wavelengths). Energy outside

after only a few feet of atmosphere all the CO₂ energy in the CO₂ absorption bands are completely absorbed. But these arguments were all handwaving with no experimental backing. What percentage of the CO₂-absorbable energy is now being absorbed? How much CO₂ in the atmosphere will achieve 100% absorption in those wavelengths? Thank you, David Matz, PhD 140 N Village Lane Chadds Ford, PA 19317 (12/8/09)

A Dave, I assume you got my other email. I can address this one quickly by including an answer I have given other folks below and recommending for further questions that you visit the IPCC links I sent. The IPCC reports have been prepared by myself and 100s of other folks over the years using all the climate scientific literature. They really are valuable for all concerned. Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out. The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>...radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Dale Kaiser CDIAC

Q Most articles I see discuss the terrible effects of polar ice caps melting and of extreme temperatures and then they talk about reducing CO₂ to avoid these problems- without ever showing a scientific relationship between CO₂ in the atmosphere and the changes that we have seen. Of course there are mathematical models that can show all kinds of effects, but I have never heard anyone discuss the quality of these models and how well they were able to predict even the next five years after they were developed. I have seen correlations between CO₂ level and global temperature but those correlations depend on the period you care to evaluate and whether you evaluate the northern or southern hemisphere. If manmade CO₂ is the cause, why didn't global temperatures increase from 1940 through 1970 when CO₂ was increasing? Why was there a large increase from 1975 to 1980, almost no change from 1980 until 1993, a huge step from 1993 to 1998, and very little change from 1998 until now? Scientists who do not believe that manmade CO₂ is the cause of global warming have proposed other natural causes. Why have these other arguments been dismissed and CO₂ accepted as the cause for global warming? How do solar flare activities relate to the global temperature effects? What other potential causes are there? Thank you, David J Matz, Ph.D. 140 N Village Lane Chadds Ford, PA 19317 (12/8/09)

A Dave, Wow, that's a lot of questions. Very good ones that take a lot of explanation. I'll try to put a few comments in line below but will chiefly rely on your examination of the IPCC links I'll also put in. On Dec 7, 2009, at 12:02 AM, Dave Matz wrote: Most articles I see discuss the terrible effects of polar ice caps melting and of extreme temperatures and then they talk about reducing CO₂ to avoid these problems- without ever showing a scientific relationship between CO₂ in the atmosphere and the changes that we have seen. Of course there are mathematical models that can show all kinds of effects, but I have never heard anyone discuss the quality of these models and how well they were able to predict even the next five years after they were developed. The relationship between atmospheric CO₂ and temperature has been studied a lot. Please see mainly chapter 2 and some of the front matter here: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> I have seen correlations between CO₂ level and global temperature but those correlations depend on the period you care to evaluate and whether you evaluate the northern or southern hemisphere. If manmade CO₂ is the cause, why didn't global temperatures increase from 1940 through 1970 when CO₂ was increasing? Why was there a large increase from 1975 to 1980, almost no change from 1980 until 1993, a huge step from 1993 to 1998, and very little change from 1998 until now? Changes in atmospheric CO₂ and average global surface temperature will not show a simple correlation because of the myriad complexities of the earth-atmosphere-ocean system and the associated fluxes of heat energy over various timescales ranging from days to decades. Here is a good read: <http://www.realclimate.org/index.php/archives/2009/10/a-warming-pause/> Also, for this question see the paper I've attached to this email. Scientists who do not believe that manmade CO₂ is the cause of global warming have proposed other natural causes. Why have these other arguments been dismissed and CO₂ accepted as the cause for global warming? How do solar flare activities relate to the global temperature effects? What other potential causes are there? The best place to compare all these "forcings" of climate is in the IPCC assessment report. See the FAQ section here, p. 101 is to the point: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_FAQs.pdf in addition to the chapter 2 link above. Regards, Dale Kaiser CDIAC

Q I'm interested in daily AOD data for Mexico that covers the period 1987 to 2000. Does it exist? How can I obtain it? (12/8/09)

A Dear Dr. Oliva, Your question regarding AOD data for Mexico was forwarded to me. Thanks for your interest in CDIAC data products. However, CDIAC does not archive AOD data. Your best source for this data will be the MODIS Aerosol Product that can be found at http://modis-atmos.gsfc.nasa.gov/MOD04_L2/index.html When you start to order the files through LAADS WEB, you'll be looking for level 2 products. Good luck, Les Hook

Q I have noticed a discrepancy between your data and other data from the DOE and IPCC. Where your totals for recent annual CO₂ emissions are ~8.2 Gt, other sources list values as high as ~29.2. As a student of climate modeling and climate change, I am having a hard time reconciling these disparate numbers. Can you help to clarify this for me? Thank you, Peter Adrian '11 The Evergreen State College Olympia, WA (12/7/09)

A Hi Peter, DOE and IPCC estimates are expressed in units of carbon dioxide (CO₂). Our estimates are expressed in units commonly used in carbon cycle budgets (i.e., units of carbon). To convert our units to theirs, simply multiply by 3.667 or the quotient from the difference in the molecular weight between CO₂ and C.

[44/12]. I think you will find the resulting estimate to be very similar. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[from Greg] Peter, some data sources give CO₂ emissions in mass of carbon dioxide, we give emissions in terms of the mass of the contained carbon. The representations are identical and differ only by the ratio of the molecular masses. Multiplying our numbers by $44/12 = 3.667$ should put you very close. Gregg

Q How does the current CO₂ concentration referenced on your site of 360 ppmv relate to the total atmospheric volume of the Troposphere at 259,333,411,782.86 cubic miles (1,088,829,865,065.96 cubic Km) and the Stratosphere at 524,411,971,405.66 cubic miles (2,205,012,543,476.76 cubic km)? Lets say, a drop for how many cubic what of water? (12/7/09)

A The current atmospheric concentration of CO₂ is about 385 ppmv. Ppmv means "parts per million by volume". So of every million cubic km of atmosphere 385 of them are CO₂. Gregg

Q how does one separate methane from carbon dioxide in a mixed bio-gas in a cost effective way? (12/6/09)

A The Carbon Dioxide Information Analysis Center is largely concerned with data and analysis related to carbon dioxide and climate change. Information on physical and chemical separations such as you describe are simply beyond what we are able to do. Sorry! Gregg Marland

Q can we change carbon into oxygen? if so how? (12/2/09)

A no, you can not.

Q China is building 500 major coal-fired power stations over the next 5 years. What is the projected annual CO₂ output from them as they come on stream? (12/2/09)

A Hi Peter. I'm going to forward this to my colleague Gregg Marland who is much better qualified to answer your question than I am. However, I would like to mention that many of the new coal-fired plants are replacements for older, dirtier, and less efficient plants. Nonetheless, the net addition of coal-fired power plants is likely to be a big player in future CO₂ emissions. TJ Blasing

[from Gregg Marland] Peter, we at CDIAC do little with projections, mostly we work with historic data. The amount of CO₂ from a coal-fired power plant depends, of course, on how large it is and what fraction of the time it is operated. Gregg

Q Your charts refer to some 8 billion metric tons of carbon emissions annually. I need to know if this is truly "mass of elemental carbon content" of the emissions, or if you actually mean "mass of carbon dioxide." Carbon and carbon dioxide are used loosely and interchangeably and there is nearly a three-fold mass difference between them. Perhaps a note to this effect on your charts would prevent misinterpretation. Thank you! (12/2/09)

A Our charts are mass of elemental carbon. It used to be that virtually all of our data users had no problem with this, but with the profile of data users expanding so much in the last couple of years, there are indeed many people who are either confused or simply do not understand the difference. I think you are right that we need now to deal with this in some way on the web site. Gregg

Q H₂O and CO₂ have similar absorption spectra, especially in the thermal radiation wavelength range. How come the effect of water vapor in the atmosphere in absorbing the solar radiation is not considered as a threat? Thank you. (11/30/09)

A Hi, If you mean "solar" radiation rather than outgoing heat/infrared radiation, water vapor does absorb some incoming solar, but not a great deal. I suspect what you may be getting at is the relative greenhouse warming due to water vapor vs. CO₂. Water vapor is the most important GH gas by far. Future warming will mean that the air can hold more water vapor and thus result in enhanced absorption of outgoing IR. The key is: it's the increasing CO₂ that has rocked the boat to cause most of the warming in the first place. That warming results in more water vapor in the atmosphere, what we call a "positive feedback". Such water vapor increases only happen due to the enhanced warming driven by CO₂ increase. Here are a couple of very good sources related to the earth-atmosphere radiation budget: <http://oceanworld.tamu.edu/resources/oceanographybook/radiationbalance.htm> <http://www.realclimate.org/index.php/archives/2007/05/start-here/> Regards, Dale Kaiser CDIAC

Q I am a student at University of Connecticut And some of the professors I asked could not answer this. How much of the current CO₂ level is anthropogenic? By that I mean what percentage of 388ppm of CO₂ is anthropogenic? (11/30/09)

A Erald, Good question but one without a simple answer. The atmosphere is a dynamic place. Carbon is constantly flowing into the atmosphere and out of the atmosphere. This carbon is being exchanged with the other major reservoirs of the terrestrial biosphere and the oceans. The fossil fuel reservoir is unique in that the carbon flow is essentially in one direction only, which is from the reservoir to the atmosphere (the rate of fossil fuel creation is negligible compared to the rate of its extraction over the time frames of the last three centuries). So, the answer to your question is dependent upon the exact year and day of that year as the flows of carbon into and out of the atmosphere are highly dependent on short and long term carbon cycling. There is no simple answer to your question. You may be interested in to know how much fossil fuel CO₂ is retained in the atmosphere. This has been studied and while that rate changes over time (depending on how active exchange is with the terrestrial biosphere and the ocean reservoir), over annual time frames about 45% of emitted fossil fuel CO₂ is retained in the atmosphere. This is the primary driver in the increase in atmospheric CO₂ over recent time spans. I hope this answer was of use to you. Sincerely, Robert Andres

Q How would you be able to estimate the amount per year of Carbon Dioxide discharged into the atmosphere for the volcanic regions of the world? (11/30/09)

A Angelin, I can quickly think of two ways to measure CO₂ emitted by volcanoes. The first method is the one that has been traditionally done. That is you go to a volcano and measure the amount of CO₂ being emitted. This can be done by either direct or remote sensing methods. Once you make your measurement at that volcano, you then need to extrapolate that measurement to the annual time frame your question posed. To get a global estimate, you then need to repeat measurements at other volcanoes and/or extrapolate from your measurements for the other volcanoes of the world. The second method is one that has not been traditionally done, but some people are discussing how to pursue it. This method would involve measurement from space. A sensor aboard a satellite can measure CO₂. A particularly good sensor would be needed to measure volcanic CO₂ as there are problems with seeing through the atmosphere to the volcano and distinguishing between background CO₂ and volcanic CO₂. This approach would also have the same sampling problem I mentioned above, extrapolating from the satellite measurements to all volcanoes of the world and to annual time scales. I hope this answer was of use to you. Sincerely, Robert Andres

Q Can you please tell me how many kg's of carbon is produced from the burning of each individual fossil fuel? (11/29/09)

A Very roughly, the numbers in kg C per billion joules of fuel are 25 for coal, 20 for petroleum and 15 for natural gas. If you want real numbers to do some calculations let me know and I will do better tomorrow when I am in the office. Gregg

Q I would like to use data on total carbon emissions and per capita carbon dioxide emissions as reproduced by a BBC story (url linked attached - http://news.bbc.co.uk/2/hi/in_depth/629/629/7133136.stm) in an article I am writing on carbon efficiency. I will make sure that I source you. Kindly provide me approval for this. If you have updated data that would be appreciated too. Best Regards Alka Banerjee Vice President, Global Equities Index Services Standard & Poor's New York (11/29/09)

A Dear Alka, You are welcome to use our fossil fuel carbon emission estimates in your article. For the latest estimates and our suggested citation, please see http://cdiac.ornl.gov/trends/emis/overview_2006.html. Good luck with your article. Regards Tom Boden, Director Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q What sorts and sources of information are best used to convince non scientists that global warming is human induced and a real threat to upcoming generation? For example, there must be renowned scientific organizations that agree on this. I'd like to be able to cite some convincing facts in the face of those folks who don't seem to understand that there is a clear scientific consensus on this matter. I do a blog and am also writing a revised edition of a book and would like to point to this as a real and serious matter in a way that defeats the political football aspect of it as well as possible (11/28/09)

A Dear Paul Martin, The IPCC reports are probably as good as any. Google to IPCC, WGI to find them. Sincerely, TJ Blasing

Q The other day someone told me that the actual global warming was due to a natural Earth process, but I believe that human activities are causing this increment on the general surface temperatures (due to an excess of CO₂ concentration). My question is: Can I find a webpage or institution that can show, through scientific experiments, the historic Earth's CO₂ concentrations from thousand years ago? I would appreciate guidance on this matter. Regards, Fermin Legorreta (11/27/09)

A <http://cdiac.ornl.gov/trends/CO2/> Fermin, try starting on this web page and see if it does not yield what you want. Gregg

Q Dear Sirs. I'm a student at a Swedish upper secondary school, and we're working on an environmental project. We have been given the task to study about Poland's influence to the global warming. We wonder why the figures differ so much in year 1919.

Are the figure incorrect or why did Poland stop their Emissions from solid fuels? <http://cdiac.ornl.gov/ftp/trends/emissions/pol.dat> <http://cdiac.ornl.gov/trends/emis/pol.html> Sincerely, Rasmus Sobel (11/26/09)

A Hi Rasmus This looks like it might be an interesting question for you to explore a bit. In assembling data on energy use for historic time periods we have gone back to many different sources of data and used the best we could find. Obviously we did not find much data on coal being used in Poland during 1919. This was right at the end of the First World War and there are several possible explanations. It could, of course, be a simple error. More likely it has to do with the end of the war. Is it because of damage to Poland so that coal was not being mined and used, or perhaps the official statistics were having trouble at the end of the war and data were simply not being accurately collected. You have done well to observe that there is obviously something different about Poland in 1919. The question whether this is a data error or if there is some other explanation is a good one. This is a nice challenge in examining and analyzing long data time series. If you look into this further I would be interested to know what you discover. I just Googled the ABB Industrigymnasium because I was curious what kind of school it was and where it is. I recently spent one year at Mid Sweden University in Östersund and really enjoyed my year in Sweden. Halsningar Gregg Marland

Q Why are your per capita estimates about 1/3 of that of the World Bank estimate of 16.6 metric tons per capita? The IEA estimates are similar to those of the World Bank at about 18 tons per capita - Thank you (11/25/09)

A Leslie, our estimates are tons of carbon per person while these other data sets give tons of carbon dioxide per person. The two values are related by the ratio of the molecular masses so you should find that their values are larger than ours by $44/12 = 3.667$.
Gregg

[from TJ Blasing] They are referring to carbon dioxide, we are only referring to the carbon in the carbon dioxide. We study the carbon cycle, and a carbon atom can dance with several atomic partners in the course of that cycle, so we just track the carbon. Try multiplying our numbers by 3.67 ($=44/12$) = (C + O₂)/C and see how close you get to their numbers. Happy holidays! TJ Blasing

Q I was wondering if you had available statistics of the average carbon footprint of an individual wild animal, and also that of early hominids to contrast with that of modern man. I've been looking everywhere for the info and people only seem to be concerned with preaching the doom of the planet. Also the average carbon effect of everyday activities that would relate to, say, 11-14 year olds of the western world, i.e.; the exact difference in carbon emissions between car-pooling and getting a lift just for yourself, wasted technology like old cell phones and fridges etc. It's to teach kids about it but also to relay the ideas as mathematical problems, any figures you could send me on any of the above would be a great help (11/24/09)

A Dear Timoklon, Animals and early hominids do/did not use fossil fuels, but rather used renewable fuel sources. Sincerely,

Q Hi! I am Natina Yaduma, a first year Phd student in the University of Manchester. Is it possible to get Nigeria's air pollution data- carbon emission, concentration of particulate matter, ozone, nitrogen oxide and other air pollutants in Nigeria? Thank you in anticipation of a favourable response. Natina Yaduma (11/22/09)

A Dear Natima, Thank you for your interest in CDIAc data products. The carbon emission data for Nigeria that we have are in the Kyoto Protocol Summaries (1990-2006). They are found at link: <http://cdiac.ornl.gov/trends/emis/annex.html> (clickable map). You might also check some of the other links on this page: http://cdiac.ornl.gov/trends/emis/meth_reg.html. Unfortunately we don't have any air quality data for Nigeria. But, a quick Google search turned up a recent vehicle pollution study: http://www.eurojournals.com/ejsr_34_4_11.pdf. Let us know if we can be of additional assistance. Good luck, Les Hook

Q Hello there. I have been looking at the historical CO₂ emissions for regions and particular countries. I noticed that there is a sudden change between the years 1905 and 1906 for Centrally Planned Asia (I assume caused by the large increase in China's CO₂ emissions). It increases from 847 to 4898 thousand tonnes of carbon in this one year period. This struck me a little odd, and I was hoping you might be able to explain why there is such a sudden jump, or if there is a mistake in the earlier datasets. Thank you so very much for your help (11/17/09)

A Gemma, As you can imagine, it is not an easy task to try to assemble some of these historic data sets. We have used multiple sources to try to find historic data on energy production, consumption, and trade around the world. If you look very closely you will no doubt find lots of anomalies that are hard to understand in detail. On the other hand, I am convinced that basic magnitudes and trends have been accurately captured. I would hesitate to label it a "mistake", but I think it is indicative of the uncertainties in the details of the historic data sets. It is possible, of course, that deep digging would reveal some logical explanation for a large jump in fossil fuel use over a short period of time. Gregg

Q In my town we have a factory that is a major contributor to the carbon dioxide emissions in the town. I was wondering if there is a way to determine if a minimization of tree excavation or implementing an aggressive planting plan around the facility would help the consumption of CO₂ to produce a bit more O₂ around the city? (11/17/09)

A Dear Chris Buie, In general, during the growing season, CO₂ emissions from thermal sources rise into the free atmosphere and disperse (dilute) pretty quickly. I'm not sure planting trees near the site would help more than planting trees anywhere else. Rich

find interesting and it points you to a couple of good resources Regards Dale Kaiser----- Hi Ben, Thanks for writing to CDIAC and for your kind comment on our site. Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports <http://ipcc.wg1.ucar.edu/wg1/wg1-report.html>... radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Happy reading Regards Dale Kaiser CDIAC

Q Hi, I am working on a PhD with Jim White and John Miller at INSTAAR/CU. I have been using some of your globally gridded and annual mean fossil fuel flux data (as well as estimates of delta 13C of emissions) in inverse models aimed at developing a better understanding of the interannual variability in the net land and ocean surface fluxes and their associated isotopes. I am wondering how I should cite your data in my PhD dissertation proposal, as well as in future publications? Thanks so much for the great data that you guys put out. Best, Caroline Alden (11/11/09)

A Cleverly concealed way down at the bottom of the ASKII text documentation at: http://cdiacornl.gov/epubs/ndp/ndp058/ndp058_v2009.html It says: CITE AS: Andres R.J., T.A. Boden, and G. Marland 2009. Annual Fossil-Fuel CO₂ Emissions Mass of Emissions Gridded by One Degree Latitude by One Degree Longitude Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory U.S. Department of Energy, Oak Ridge, Tenn, U.S.A. doi 10.3334/CDIAC/ffe.ndp058.2009 I have also attached a paper that will be of great help in getting your PhD. You can also tell Jim and John that you have my sympathies having them as mentors, they would probably be interested in the attachments also. Cheers TJ Blasing

[T] attached "HELPFUL HINTS FOR GETTING YOUR PhD.doc"

Q Hello, I obtained historical sunshine data from NASA website (http://gcmd.nasa.gov/records/GCMD_CDIAAC_NDP21.html) and have few questions - Were the amount of sunshine hours based on measurement and prediction? - If the sunshine hours were predicted, do you have information on how they were modeled/predicted? Many thanks in advance for your time and attention, Natalia (11/10/09)

A Natalia, All data values are actual measurements. The full documentation is contained in the file ndp021r1.txt at this location: <http://cdiacornl.gov/ftp/ndp021/> Regards Dale Kaiser CDIAC

Q Hello I'm in the process of researching temperature data in the US and have found your information of incalculable benefit. Are the data sets, presented here, raw data or are they adjusted for UHP? If the data sets are adjusted, can you detail the algorithm by which that adjustment is calculated? Sincere thanks - Jay Holben Los Angeles CA (11/9/09)

A Hi, Thanks for your question and glad you find the data useful. I'm guessing you are talking about the monthly mean data rather than the daily. If that's the case, the link below gives you the documentation. Yes, these data are adjusted, but vs. 2 of this dataset does it in a new way compared to the explicit "UHI" adjustment used in the earlier version. This web page also gives you the citations of the papers that fully describe how the NCDCEPIs did the adjustments http://cdiacornl.gov/epubs/ndp/ushcn/monthly_doc.html If this doesn't point you to the right answers, just holler back. Regards Dale Kaiser CDIAC

Q I was just wondering how CDIAC measures the concentration of carbon dioxide in the atmosphere. Thank you. (11/7/09)

A Actually, we are a repository for data from a number of suppliers who actually take the measurements. We also organize the data, present it graphically, provide some additional quality assurance, and write it up in terms of atmospheric trends. One of the things we do is write up how the measurements are made. They are mostly based on the infrared absorbing properties of CO₂; radiation emitted by a radiation source radiates through a measuring cuvette containing the gas to be measured and impinges on a detector. On the way through the measuring cuvette, the initial intensity emitted by the radiation source is attenuated by absorption processes. Attenuation is a CO₂-absorbing wavelength proportional to the CO₂ concentration in the gas in the cuvette. For CO₂ measurements, the gas is often cryogenically prepared (cooled to a very low temperature) first, so that water vapor is condensed out. Water vapor would provide interference because it absorbs in many of the same wavelengths as CO₂. The in situ measurements are discussed briefly at: <http://cdiacornl.gov/trends/CO2/sio-mlo.html> and in more detail in the references given. TJ T. J. Blasing Building 1509, Mail Stop 6335 Oak Ridge National Laboratory Oak Ridge, TN 37831 Phone (865) 574-7368 FAX: (865) 574-2232 E-Mail: blasingtj@ornl.gov

Q Is the 2006 data the latest for your country-by-country CO₂ emissions list? (11/5/09)

A Rabeika, We have estimates for most countries for 2007 and 2008 that are scheduled for release on Nov. 17. We have a manuscript in press in a peer reviewed journal that uses some of these numbers and we have agreed not to make them publicly

available until that time. What kind of timeline are you working on? Gregg

Q The albedo or reflective properties of the earth is an important concept in climatology and must also be accounted for in the climatology models used. Do you have any data on this? If not is there another body/organization I could ask? Regards Einar Eldoy (11/4/09)

A Dear Einar Eldoy, We appreciate your question to the CDIAC Web site. I would read up on some of the general circulation models of climate; they attempt to model albedo changes and include them in estimates of global warming. Unfortunately the best introductory texts on the subject of general circulation models are in French, one has been translated and is online at: http://stratus.astr.ucl.ac.be/textbook/chapter3_nod8.html Sincerely, T.J. Blasing

Q The albedo or reflective properties of the earth is an important concept in climatology and must also be accounted for in the climatology models used. Do you have any data on this? If not is there another body/organization I could ask? Regards Einar Eldoy (11/4/09)

A Einar, Yes, albedo is a critical parameter for running climate models. Most input datasets rely mainly on satellite observations, typically pretty long-term datasets derived from sat. observations that are improved with other types of models and surface observations. I suspect that most models use similar datasets but not identical. You can probably get ideas from the following sources. Good question! <http://earthobservatory.nasa.gov/Newsroom/view.php?old=200207099816> <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> (mostly chapter 8) <http://ams.allenpress.com/perlsery?request=get-document&doi=10.1175%2F1520-0450%281999%29038%3C0712%3AROLSA%3E2.0.CO%3B2> Regards, Dale Kaiser CDIAC

Q I've seen estimates of current per capita GHG emissions, but I was wondering if anyone has calculated the CUMULATIVE impact by country to current atmospheric GHG concentrations from the country's past GHG emissions (and other impacts like deforestation). The population of a country benefits from a society and infrastructure built over time, so it seems fair to look at the cumulative per capita impact, not just the current one. (11/4/09)

A There are a couple of questions that arise in thinking about this, but let me start by saying that it is straightforward for you to import our data into a spreadsheet and calculate cumulative emissions by country. You could then divide by population to get a per capita value, but would you use current population? Also, CO₂ put into the atmosphere gradually is taken up by the oceans and biosphere so some of the earliest emissions are no longer in the atmosphere. Would you consider all past emissions or would you try to adjust for the fraction of past emissions that have been absorbed so that you are only dealing with past emissions that are still in the atmosphere. Interestingly, people have calculated cumulative emissions and cumulative emissions still in the atmosphere but I don't know that anyone has tried to think of this in terms of per capita emissions. Gregg

Q Are there graphs that compare the earth's mean CO₂ concentration versus the earth's mean temperature for the past 100 years? Thank you, Gordon Criswell (11/3/09)

A Gordon, One can certainly plot both variables on the same graph, and this certainly has been done. One doesn't readily see it any more because it's a very simplistic approach for 2 variables that, while in the long run are certainly related, are not a 1:1 correlation. CO₂ increases are basically exponential due to anthropogenic emissions, whereas temperature is effected by many things with many feedbacks involved. While climate scientists are VERY confident that man-made CO₂ emissions account for most of the temperature increases over the last century or so, we try to explain it with more than just the one graph. Please see other users' questions and my responses below and I think this will get you to the best information. Regards, Dale Kaiser CDIAC

----- 1) While there is no simple relationship (e.g., an equation including the 2 variables) that can describe global mean surface temperature and greenhouse gas concentrations, CO₂ concentration can generally be described as increasing exponentially since the start of the industrial revolution. However, global mean temperature, since it began its dramatic upswing in the 1800s, is not really increasing exponentially. There have been a few ups and downs, and even semi-flat periods, but the dominant trend is strongly upward. Sometimes these two variables are plotted on the same graph, but the emphasis is simply to show the positive correlation that climate scientists think results from a very real physical relationship in which CO₂ concentrations influence global temperatures. The relationship (for both conditions over the past century or so, AND into the future) is largely studied using many types of climate models. Rather than gather and paste many links here to specific graphics I'll point you to the main web page of Working Group I (concerned with the physical science basis of climate change) of the Intergovernmental Panel on Climate Change - the best overall authority on all things climate. Along with the front matter I would recommend you look at sections 1-3, to start <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> Sincerely, Dale Kaiser CDIAC

> Can you tell me a website where I can find the relationship between Earth's surface temperature rise and concentration of greenhouse gas? I've read that it is logarithmic

----- 2) Michael, The best concise discussion of this question that I've seen is in a recent National Academies report: <http://americasclimatechoice.org/basicsshtml> ... see page 10 of this pub. The linkage of CO₂ and temperature over the millennia is a little bit different animal than over the past 100-200 years. Hope the above helps. I consider it expert and authoritative. Regards, Dale Kaiser

----- Original Message ----- From: Michael Blumhardt

[mailto:michael@blumhardt09.com] Sent: Mon 3/30/2009 1:12 PM To: Kaiser, Dale Patrick Cc: Boden, Thomas A.; Baes, Fred Subject: Questions submitted to the CDIAC Web Site Question: Is it true that the Vostok ice core data demonstrates historical

temperature rises have preceded rises in atmospheric carbon dioxide by hundreds of years?

Q Monthly Atmospheric $^{13}\text{C}/^{12}\text{C}$ Isotopic Ratios for 10 SIO Stations C.D. Keeling A.F. Bollenbacher and T.P. Whorf Carbon Dioxide Research Group Scripps Institution of Oceanography Period of Record 1977-2002 Question: Are there more recent data than 2002? If so, I'm having trouble find these values Thanks Ken Towe (11/3/09)

A Ken, All of the data we have are on the website and you have found those. More recent data has yet to be submitted to us by the data collectors. For more up-to-date data, I suggest you contact Ralph Keeling (rkeeling@ucsd.edu) to see if such data are available. Sincerely, Robert Andres

Q I was viewing the related information about carbon dioxide emissions from EPA and linked to CDIAC website. I found this is a interesting website center. Here is my question: There are a calculator for personal carbon dioxide emissions in daily life but how is the figures mathematically be calculated? Is there any formula or theory to calculate carbon footprint? How if I apply these formulas and theories to calculate the carbon footprint of motors that used in industry? Does it also work? If it is convenient, could you provide me the related information about carbon footprint calculation? (11/3/09)

A Wei Jung: Several calculators are available on the web; some are better than others, and some are wrong. The ones at EPA sites are as good as any and better than most. http://www.epa.gov/climatechange/emissions/ind_calculator.html <http://www.epa.gov/RDEE/energy-resources/calculator.html> For industrial processes, the numbers in the following link are as good as you can find. Notice I didn't say that they were anywhere near perfect, but it's pretty difficult to determine some of the numbers. <http://www.epa.gov/climatechange/emissions/download09/IndustrialProcesses.pdf> The Environmental Protection Agency keeps track of these things because they are a regulatory agency, that is also why they express things in units of CO_2 , while those of us who do research on the carbon cycle just keep track of the carbon. For fossil fuels, we first look at the heat realized from combustion of the fuel, some is due to the oxidation of carbon, some to the oxidation of hydrogen and for heavy oil and coal some may be due to the oxidation of sulfur and other impurities. The heat output from complete combustion is measured with a bomb calorimeter and the resulting CO_2 is also measured. Carbon coefficients are then calculated; these are in the range of 20 grams of carbon per megajoule of energy, with gaseous fuels having lower carbon/hydrogen ratios and therefore lower carbon coefficients (around 15), and coal having higher C/H ratios and carbon coefficients of around 25. For electricity, I am enclosing a paper to show you how we calculate carbon per kilowatt-hour. The "0.0026" should be 0.026, but the numbers in the left hand column are all correct. The U.S. average is pretty close to the TVA average and the numbers EPA uses are sometimes a bit dated, but so are the ones in our paper. This should be enough information to keep you busy for awhile; if there are any gaps remaining that you can't fill, just send us another e-mail. T.J. Blasing

Q I wish to know the molecular origin of the mid-ir absorption bands of CO_2 gas at around 4.3 microns, in particular those high resolution line intensities (11/2/09)

A Li Jiang, It has been awhile since I have done ir spectroscopy but the basic reason for the CO_2 absorption band at 4.3 microns is due to that wavelength of light corresponding to rotational/vibrational bands of the CO_2 molecule itself. Thus, light at that particular wavelength is absorbed by the CO_2 molecule. Sincerely, Robert Andres

Q How can I compute CO_2 concentration in atmosphere (units ppmv) from C emission (units MMt) data which I download here (11/1/09)

A It cannot be done. C emissions during the year are only one of many factors that affect the annual increase in the atmospheric concentration of CO_2 . You can find the concentration of CO_2 in the atmosphere on our web site, though. Our best, Gregg Marland

[from Lianhong Gu] Dear Ting, I guess you probably meant how to convert the amount of carbon emitted to the atmosphere in mass unit to the increment in the atmospheric CO_2 concentration in ppm. If that is the case, a change of 1 ppm in atmospheric CO_2 concentration is equivalent to about 2.13 GtC. Lianhong Gu

Q Where can I find the mathematical kinetic energy calculations that prove that the additional CO_2 added to our atmosphere during the past 50 years (approximately 0.006% by volume) absorbs sufficient energy and imparts it to our atmosphere to account for the supposed increase in global temperature? (10/29/09)

A Louis, Attached is perhaps the best introductory paper on the subject. For quantitative analysis, the following is a bit general but on the simpler side. Larry L. Gordley, Benjamin T. Marshall and D. Allen Chu. Linepak. Algorithms for modeling spectral transmittance and radiance. *Journal of Quantitative Spectroscopy and Radiative Transfer* 52 (5) pp 563-580 (Nov. 1994). Different numbers have been given for the temperature increase from a doubling of atmospheric CO_2 . I like 1.2 degrees C, but that number does not count several feed-forward mechanisms that would raise the temperature even further and have to be dealt with using general circulation models of climate. When those are included, the number goes up but so does the uncertainty. T.J. Blasing, Building 1509, Mail Stop 6335 Oak Ridge National Laboratory, Oak Ridge, TN 37831. Phone: (865) 574-7368. FAX: (865) 574-2232. E-Mail: blasingtj@ornl.gov

[T] attached PDF "Arrhenius_1896.pdf"]

Q Hi, I'm using your GUI to download climate data from all WA and OR stations for as far back as data is available. Is there any way to download data from a whole state without going through station by station? My computer doesn't like your zipped files and won't open them...it's a Mac. Thanks for your help. Susan Waters(10/27/09)

A Susan, Yes, be it daily data or monthly, you should be able to get your state data on your mac (of course, if monthly you have to grab the whole country and then grab your states via a command or program you're gonna read it with). I've only been switched over to a mac for about a month, and it actually is easier than PC. If you go to the ftp area for either daily or monthly: http://cdiac.ornl.gov/ftp/ushcn_v2_monthly/ http://cdiac.ornl.gov/ftp/ushcn_daily/ and click on a file (left click), this is what I'm getting and doing. The dialog box asks me if I wanna open, in which case it's telling me that by default it's gonna use "stuffit expander". And that works, leaving me with the .txt file in /Downloads. If I choose save (goes to downloads folder), I open a terminal window, go to that directory and type "gunzip" (filename). Let me know if you still have trouble. We could always go through it on the phone. Regards, Dale Kaiser

Q Hello, I was wondering if the CDIAC has historic emissions data for Japan previous to 1950? Or if the CDIAC had recommendations on where to locate this data. Thankd (10/27/09)

A The CDIAC time series for Japan goes back to 1868. See <http://cdiac.ornl.gov>, click on "fossil fuel CO₂ emissions" at the bottom right of the page, then click on "global, regional, national.." or "top 20..." and follow the path to Japan. AND LET ME KNOW IF THIS DOES NOT LEAD YOU THERE QUICKLY Gregg

[from Tom Boden] Hi Jennifer, We do. http://cdiac.ornl.gov/trends/emis/tre_jap.html Please let me know if you need additional time series. Thanks Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I need to find CO₂ emissions from refineries. Is this data available? I see that some CO₂ data is available from "gas flaring". Is this the equivalent of refinery emissions? Thankyou. (10/27/09)

A Gas flaring is not the same as emissions from refineries. I am not sure what your question really is, Paul? Do you want total emissions from all US refineries, emissions from a particular refinery? For US refineries, for global refineries? If your interest is the US, I think you can get some insight from the US National Reports to the Framework Convention on Climate Change. This is published annually by the EPA and can be found by going to the EPA web site and then tracking through to greenhouse gas emissions. If you want to be more specific what you are looking for I can try to help more. We actually did the explicit calculation for all US refineries for one year - I think it was 1986 or something back in that era. Gregg

[Paul replies...] We're looking for total CO₂ emissions from all refineries in the world, all in the U.S., and by state, if possible. I will check the report you mention. Unfortunately I think we need something more recent than 1986. Thankyou. Paul

[T] chimes in... Paul: The gas flaring data are from flaring of waste gas at the well site. Not from refineries. The following site looks as close as any I know of to what you seek: http://www.eia.doe.gov/oiaf/1605/ggrp/pdf/industry_mecs.pdf Please let me know if this helps. TJ Blasing

[and Paul replies...] Great. Thanks very much for this. Paul

Q The BGS are revising the content of their Carbon Capture and Storage web pages and would like permission to use the graph of fossil fuel emissions from 1750-present day as featured on your web page <http://cdiac.ornl.gov/trends/emis/glo.html>. We would of course acknowledge this as copyright CDIAC. Please email if you do not consent to BGS using this image. Best regards, Antony Benham(10/22/09)

A Antony, I don't even think we have a copyright. Please cite us as: Boden, T.A., G. Marland, and R.J. Andres. 2009. Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi:10.3334/CDIAC/00001. Or as close as you can come to that: http://cdiac.ornl.gov/trends/emis/overview_2006.html gives this same citation. You may also wish to see: http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2006_2007.xls For some (pretty good) estimates for 2007. TJ Blasing

Q I wish to write an article on local newspaper on how CO₂ in the atmosphere hits the nations. According to 350.org (global campaign) 350 is the number that is safe maximum limit for carbon dioxide in our atmosphere globally. I wish to write

something on this and include local details that will mark on 24th October, the international day of climate action. Thank you.
Angela (10/22/09)

A Dear Ms. Samson, Thank you for your interest in CDIAC. If you are seeking background information on CO₂, I would recommend that you start with the CDIAC FAQ section (<http://cdiac.ornl.gov/faq.html>). That information along with the material on the 350.org (<http://www.350.org/>) web site you mentioned should give you enough material to start an article. Good luck, Les Hook CDIAC

Q Please expand on the below quotation: Humans eat plants and human food eat plants. However, once a human eats food, the plant life that formerly created oxygen from carbon dioxide is destroyed. It takes a considerable amount of time for that plant life to be recreated. The carbon dioxide that is breathed back into the air stays in gaseous solution for thousands of years. And human birth rates have been escalating on an exponential level since the industrial age started, while fossil fuel burning has only been around for about 150 years (and less at high levels). At the same time the population has exploded and the forests have been decimated. It is not rational that now destroyed plant life that formerly converted oxygen somehow negates human respiration from incredibly expanded population growth and the destruction of oxygen-producing plant life. And, while the entire carbon-oxygen system of which the earth is the basis is a closed system, for the most part, everything within that system is dynamic. Human population explosion is the most likely cause of global warming if carbon dioxide is the cause of global warming. It makes no rational sense that human and animal respiration is not, by far, the most important factor in increased current greenhouse gases. I would be very interested in having my understanding explained, one way or the other. Thanks, Jeff Q. Should we be concerned with human breathing as a source of CO₂? **A.** No. While people do exhale carbon dioxide (the rate is approximately 1 kg per day, and it depends strongly on the person's activity level), this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere. Of course, the agriculture, food processing and marketing industries use energy (in many cases based on the combustion of fossil fuels), but their emissions of carbon dioxide are captured in our estimates as emissions from solid, liquid, or gaseous fuels. [RMC] (10/22/09)

A Hi, Here is a response that I'd sent someone else who just could not accept that human exhalation of CO₂ was not behind the buildup in the concentration of atmospheric CO₂: "...Here is the point though, from the A to the FAQ: ...this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere. Even if this were NOT the case, (but it IS the case), some scale analysis can be done. Fossil fuel emissions global, per year, 2005 = about 8 X 10²⁹ metric tonnes or about 8 trillion kg of carbon PER YEAR. Then, take for example a population increase (over some number of decades) of 1 billion folks times 1 kg CO₂ (or about .3 kg C) times 365 days/year, or about 110 billion kg of C per year. Fossil fuel CO₂ compared to human breathing a factor of about 75...." The only other thing I'll add is that, yes, deforestation is a major player in CO₂ emissions. This is well recognized. See: <http://cdiac.ornl.gov/trends/landuse/houghton/houghton.html> Dale Kaiser CDIAC

Q My son is conducting a science fair experiment that involves burning charcoal briquettes. It would be helpful for him to know how much CO₂ is emitted by burned charcoal briquettes. A ORNL study from 2003 by Tristram West references his study in which charcoal burned for 1 hr emits 11 pounds CO₂. Can you please provide more detail on this study or provide another source of information to help my son know how much CO₂ is produced by burning charcoal? Thank you, Craig Price, (10/22/09)

A Dear Mr. Price, I have not produced a final publication on this topic. However, I do have some points and additional data that might be of use to you. Please find this information attached in PDF format. Thank you, Tris West

[Tris attached PDF file "C emissions from BBQ grills_edit2007.pdf"]

Q Hello, My organization is conducting research using data on global greenhouse gas emissions. In the past, we have used data from "Global, Regional, and National Annual CO₂ Emissions from Fossil-Fuel Burning, Cement Production, and Gas Flaring 1751-1998" (NDP-030) by Boden, Marland, and Andres. I understand that a more up-to-date version of that database (for 1751-2006) is available on your web site, but it would still be useful if I could obtain the data from the 1751-1998 version. Is it possible for you to e-mail me that database? Thank you, Alexander Murray Economist Centre for the Study of Living Standards (10/20/09)

A The CDIAC emissions data base is updated and extended every year. The most recent revision, up through 2006, is what appears on the web site currently. Data from 1998 and earlier years will have been revised, sometimes considerably. For current research purposes we would recommend using the current data base, but if you do really want to look at the historic data sets they are available on request. Just let us know if you want the global totals, specific countries, or the full data set.

Q Regarding your findings as shown in "d13C in CO₂ at Mauna Loa, Hawaii". Do you have the data from 2001-present? Would you happen to have it in a graph form as well? My friend and I are working on a book he wants to get published on Climate Change and we were wondering if this information was available. Thanks, Eric Iseler (10/20/09)

A Eric, These files go through 2006. You can read them as text and convert them to EXCEL and graph from there. TJ Blasing

[T] attached a number of text files]

Q Mr Blasing I am a journalist for the Sciences et Avenir magazine (France). I am preparing a paper about CO₂ emissions in industry I am looking for data about industry CO₂ emissions country by country. I wondered if the CDIAC would have these information If yes could you email me them? Many thanks in advance for your help. Sincerely yours. Olivier Hertel – Olivier Hertel Journaliste Sciences et Avenir 33, Rue Vivienne – 75002 Paris – FRANCE T : 00 33 1 55 35 56 03 F : 00 33 1 55 35 56 04 @ : ohertel@sciences-et-avenir.com (10/20/09)

A Olivier. For the United States, the best source is the Environmental Protection Agency's Inventory Report <http://www.epa.gov/climatechange/emissions/usinventoryreport.html> Which has emissions for industry, energy consumption, agriculture, etc. For other countries you might contact Jay Gregg at: greggjay@gmail.com He may be able to point you to some good sources. TJ Blasing

Q For a chart for tomorrow's paper (publishing Tuesday, October 20th) I would like to track per person emissions from fossil fuels, in metric tons of carbon, for the United States and China, 1986 to 2006 but am having trouble finding the data on your website. Could you please help me find it? My deadline is 5pm today, Monday October 19th. I GREATLY appreciate your help! (10/19/09)

A Cristina You may not be scrolling across the page far enough, it's the 2nd column from the last. For China <http://cdiacornl.gov/ftp/trends/emissions/prc.dat> For USA <http://cdiacornl.gov/ftp/trends/emissions/usa.dat> TJ Blasing

[Christina replies] Exactly what I was trying to find. THANKYOU very much for your help!

Q Do you have quarterly figures for Malaysia from 1970 through the present? (10/16/09)

A Yasminę We do not have quarterly fossil fuel-CO₂ emission estimates for Malaysia. Annual emission estimates can be found at <http://cdiacornl.gov/trends/emis/mys.html> Sincerely, Robert Andres

Q CO₂ is about 385 ppm in the atmosphere. We hear all the time about man's contribution to CO₂ levels. We measure those contributions in "metric tons" of CO₂ released by man. My question is -- how many metric tons produced by man is required to raise the ppm of CO₂ in the atmosphere from 385 to 386....(only one additional part per million) Would it be 10 million metric tons? one billion metric tons? Thank you. (10/15/09)

A Kerry. About 2 Pg-C (2 billion metric tons of carbon) would cause a one part per million increase, assuming it all stayed in the atmosphere, which it doesn't. A fraction would go into the terrestrial biosphere and the ocean, and that fraction varies from year to year but is typically about half. It would, therefore, typically take about 4 Pg-C to increase the atmospheric concentration by 1 part per million. TJ Blasing

Q Q-- Should we be concerned with human breathing as a source of CO₂? A- No. While people do exhale carbon dioxide (the rate is approximately 1 kg per day, and it depends strongly on the person's activity level), this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere. I am confused by this answer! There is no net addition of CO₂ to the atmosphere by billions of additional humans on the planet? A closed loop? Are you serious? If the plants originally took the CO₂ out of the air, and we destroy the plant (that had the CO₂ sequestered) how then is the net effect neutral? Additional humans need additional housing and food. The more humans the less trees, bushes, etc. we have (that remove CO₂), and the more humans there are require more plants to consume. Your theory does not add up. (10/15/09)

A Dear Kerry, We appreciate your question to the CDIAC Web site. Last night I had steak and a veggie salad and some ice cream for dessert. Farmers are continually growing grass species (e.g. hay) to feed the cattle to produce the meat and milk; lettuce grows every year. So the carbon I breathe out is pretty much replaced in the biosphere or I wouldn't have enough to eat next year. Well, you do raise an interesting question here: will we have enough food to feed the world? Probably not. My Dr. says I am too fat. I say I am storing carbon. There is a lot of wood in my house, that is also stored carbon. Finally, and in spite of the above, land-use change does contribute about 1.5 Tg-C (a lot) each year to the atmosphere's carbon stock. However, this is not from breathing; it's all those trees and bushes you mentioned. Sincerely, T.J. Blasing

Q Nowhere have I seen data on the contribution of emissions from volcanoes and forest fires (which seem to have become rampant recently) to atmospheric CO₂ levels, as compared with anthropogenic contributions. Where may I see this data, if it exists? (10/13/09)

A Dear Mr. Mars: The message you posted to the CDIAC web site was forwarded to me. I used to measure and study volcanic emissions to the atmosphere but do not do so regularly now. To help you with your question I took the following from a United States Geological Survey (USGS) website (<http://volcanoes.usgs.gov/hazard/gas/index.php>): "Volcanoes release more than

130 million tonnes of CO₂ into the atmosphere every year." For 2006, the latest year for which CDIAC has concluded their calculations, anthropogenic activities released 30,176 million tonnes of CO₂ from fossil fuel activities (this does not include other anthropogenic CO₂ sources to the atmosphere such as land use change) (http://cdiac.ornl.gov/ftp/ndp030/global1751_2006.ems). I have converted this emission mass from tonnes C, as reported on the CDIAC website, to tonnes CO₂ as reported on the USGS web page so that the comparison is on an equal basis. It is clear that the anthropogenic release is much greater (about 232 times greater) than the volcanic release. Looking back through the results of the CDIAC calculations, in the year 1842 anthropogenic activities released approximately 130 million tonnes of CO₂ from fossil fuel activities (same conversion factors applied); this is equal to the USGS supplied value. While volcanoes do emit CO₂ into the atmosphere which could lead to warming, the effect of volcanic CO₂ is relatively small compared to other sources of CO₂ to the atmosphere. Large volcanic eruptions cool the atmosphere. This is because sulfur, which is co-emitted with the CO₂, forms sulfuric acid droplets in the atmosphere. These droplets are very effective at reflecting solar radiation back to space. Less radiation in the atmosphere leads to cooler temperatures at the surface of the Earth. I am not an expert in CO₂ generated from forest fires. I have seen some reports that state forest fire CO₂ is about 20% of fossil fuel CO₂ emissions to the atmosphere. However, I do not know on what data those reports are based and therefore can not state how robust that finding is. I do know that forest fire emission of CO₂, like volcanic emission of CO₂, are highly variable from year to year. I have blind-copied this response to someone who may have more information about forest fire CO₂ and may therefore give you more information about this CO₂ source. Sincerely, Robert Andres

Q Dear Sir/Madam My name is Joanne Tang, researcher on behalf of Nelson Education in Toronto, textbook publisher. My question concerns the use of data from this site. Are the various graphs etc. copyrighted? (The data I'm looking for is re: CO₂ emissions) Is formal permission necessary, or will it suffice that we properly credit the source? Looking forward to hearing from you. Best, Joanne Joanne Tang Copyright Licensing & Photo Research 20 Bretton Court, Scarborough, ON, M1V 2C9 Tel: (416) 697-9298 E-mail: joannecytang@gmail.com (10/13/09)

A Joanne The suggested citations appear at the bottom of the abstracts at each site. All you have to do is follow that as well as an editor will let you. If you have any question about a citation, just contact the author or me. Otherwise, it's public domain. American tax dollars at work. Cheers! TJ Blasing

Q Hi, I saw a reference to a report in CDIAC that ranks country/states by global emissions, i.e., integrates US state emissions with global country emissions. It doesn't give the title of the document. I can't seem to find the publication on your site. Can you please direct me to the most recent ranking of state/country emissions of greenhouse gases? Thanks Jeni (10/12/09)

A Dear Jenifer Wightman, We appreciate your question to the CDIAC Web site. For a ranking of the top 20 countries as of 2006, see: http://cdiac.ornl.gov/trends/emis/tre_tp20.html. And for all the countries in the world, try the link at the top of that page to "DigitalData (all countries in a single file)". For emissions by U.S. state see: http://cdiac.ornl.gov/trends/emis_mon/stateemis/emis_state.html. I'm not sure if there is a sorted, 50-state list somewhere, but the "DigitalData (ASCII comma delimited)" link on that page will give you a file that you can download and open with something like Excel. You could then perhaps do your own sorting with the program manually. Sincerely, Dale Kaiser CDIAC

Q Today I saw CO₂ emission data from IEA report 2009 and found some discrepancies with CDIAC data. 2006 total CO₂ emissions were 28,962 million tons by IEA and 8,470,855 k tons by CDIAC. Also, each country's emission data are not the same. I think I have some misunderstanding in reading the data. Your explanation on this would be much appreciated. Thanks and regards (10/12/09)

A Kim: You are not the first to notice this; it is a frequent source of confusion in this business. We express CO₂ emissions in terms of carbon only. This is because the carbon atom changes atomic partners many times through the course of the carbon cycle, going from CO₂ in the atmosphere to C₆H₁₂O₆ after photosynthesis or carbonic acid (H₂CO₃) in the ocean and eventually forming calcium carbonate (CaCO₃), carbonate rocks, and so forth. We track the carbon through the carbon cycle, so we keep track of the carbon atom only. Limiting the discussion to the common atmospheric form CO₂, as makes sense for regulatory agencies and such, the 2 oxygen atoms are included. Carbon has an atomic weight of 12; oxygen has an atomic weight of 16; so, CO₂ = 12 + 16 + 16 = 44 = 44/12 (or 3.67) times the mass of carbon only. The 2006 totals we report are 8230 Tg-C. Subtracting international bunker fuels of 348 Tg-C = 7882 X 3.67 = 28927 Tg-C = about what EIA gets for 2006; from the numbers you gave me, I expect the number you got from EIA did not include international bunker fuels which are fuels used in international commerce and not charged against any country. That may be wrong (I haven't checked), and the difference may be due to some other accounting difference of which many are possible. TJ Blasing

Q Hello, I am interested in your 2007 article entitled "Global, Regional and National CO₂ Emissions" by Marland, G., Boden, T. A., and Andres, R. J. This article was cited in the Petition Project at www.petitionproject.org, but I cannot find the link to the project. Is there an official link to this article? The only thing I can find online are the 2 pages of graph correlations, but none are cited by credible sources. I appreciate your help. Alice Cheng (10/12/09)

A Dear Alice Cheng, We appreciate your question to the CDIAC Web site. The article you cite is really a database that is continually updated on our web site, and can be found here: http://cdiac.ornl.gov/trends/emis/overview_2006.html. On that page there are a bunch of citations to actual journal articles by Marland and others. And here are a few other useful links: http://www.ornl.gov/info/press_releases/get_press_release.cfm?ReleaseNumber=mr2008092400 <http://ipcc-wg1.ucar.edu/wg1/>

Q Hello, I have a question regarding your Fossil Fuel CO₂ Emissions section. I noticed that you quote emissions in "carbon" and not CO₂. Could you tell me why it is better to use carbon as a metric? Many thanks Antony Hirst (10/12/09)

A Antony: Different procedures work better for achieving different goals. Many researchers track carbon through the carbon cycle, and the carbon atom changes atomic partners many times through the course of that cycle, going from CO₂ in the atmosphere to C₆H₁₂O₆ after photosynthesis or carbonic acid (H₂CO₃) in the ocean and eventually forming calcium carbonate (CaCO₃), carbonate rocks, and so forth. We keep track of the carbon atom only for that reason. Limiting the discussion to common atmospheric forms, like CO₂ or methane (CH₄) makes perfect sense for regulatory agencies and such. TJ Blasing

Q If we manage to lower carbon dioxide emissions, will the concentration of CO₂ in the atmosphere decrease or plateau? When will we see a decrease in CO₂ concentration? When will we see a lowering of the temperature? (10/6/09)

A Dear Laurids Bung, We appreciate your question to the CDIAC Web site. Good questions. Indeed, lowering CO₂ emissions will lead to lower CO₂ concentration over time. There are many CO₂ emission/concentration scenarios and related temperature scenarios. The most expert general source is here as an FAQ in the IPCC reports: http://ipcc.wg1.ucar.edu/wg1/Report/AR4WG1_Print_FAQs.pdf You'll no doubt find the other FAQs there interesting too. Sincerely,

Q I would like to ask if there are excel formats for the CO₂ emission data? We are currently doing research study and analysis for GHG emissions. Thank you very much! (10/5/09)

A Margaret: Try saving the data as a text file and then reading it in EXCEL. Then be sure to save it as an EXCEL file, like I sometimes forget to do. (When you save the file, you will have several choices, including EXCEL.) That failing, get back to me and I will follow my own instructions and attach the resulting excel file in an e-mail to you. TJ Blasing

Q Dear Mr. Andres and Mr. Blasing, I'm a researcher with Rolling Stone magazine and we're working on an article about climate change. I'm trying to figure out the overall and per capita emissions of carbon dioxide for Americans, Filipinos, and the global totals. I found all of these numbers on CDIAC's very accessible website (specifically this http://cdiac.ornl.gov/ftp/ndp030/nation1751_2006.ems). For instance, the US's per capita emissions rate was 5.18 metric tons of carbon in 2006, which means that the average American emitted more than 5 tons of carbon in 2006, correct? But I've reading in many newspaper articles that the average American emits 20 tonnes of CO₂, and this stat came from the Earth Trends database. When I open the Earth Trends profile for the US (http://earthtrends.wri.org/pdf_library/country_profiles/cli_cou_840.pdf), I see that the per capita rate was around 20 tons, but that was for the year 1998 and surely this level has been rising. So I'm confused about which source to use and I'm wondering why the CDIAC number is so much lower. What I'm really trying to find is the definitive numbers for the following: US per capita emissions - Philippines per capita emissions - global per capita emissions - raw total US emissions in metric tons of carbon - raw total Philippine emissions in metric tons of carbon - global raw total of emissions in metric tons of carbon. My deadline is Monday afternoon, so any help you can provide is greatly appreciated. All the best, Debbie Levy (541) 342-5754 (west coast) (10/2/09)

A Debbie: Our figures represent carbon only, it has an atomic weight of 12. Other figures frequently also include the oxygen molecule, molecular weight 32. (carbon dioxide/carbon = (12+32)/12 = 3.67 = the conversion factor. 5.18 X 3.67 = 19. Per capita emissions have been decreasing somewhat; the 1998 number was 5.34. See <http://cdiac.ornl.gov/ftp/trends/emissions/usa.dat> 5.34 X 3.67 = 19.6 (closer to 20). My "new" Corolla gets 38 miles/gallon on the highway, the guy across the hall drives a smart car and a woman in the next building drives a Prius. People are using compact fluorescent light bulbs, the price of gas went way up last year and this year the economy is not conducive to people spending a lot on gas. -- These and other factors tend to bring the per capita mileage down. Can I get my picture on the cover of the Rolling Stone? TJ Blasing

Q What are the total man-made CO₂ emissions? i.e. from human and animal breath, fires, soft drinks, dry ice, etc. (10/1/09)

A For emissions from industrial processes, EPA is the best available source. They track it at the time of input, rather than when you pop a Pepsi: <http://epa.gov/climatechange/emissions/usinventoryreport.html> For humans, I have attached a paper by Tris West on the subject. TJ

Q Dear Sir/Madam, I'm Evelyn, and studying in a school in Macau S.A.R.. We are doing a project about Airborne impact to the Antarctica. But now we are looking for the CO₂ emission of A380. And we hope that you will have the research... Please give us a reply. Thank you very much and Best Regards Evelyn (10/1/09)

A Hi Evelyn, Our fossil fuel CO₂ emission estimates may be found at http://cdiac.ornl.gov/trends/emis/overview_2006.html. You will need to go to the IPCC website to find the actual AR4 model results, including the A380 emissions scenarios. Regards,

Q | CDIAC data are quoted here: http://www.geocraft.com/WVFossil/greenhouse_data.html The CDIAC charts depict two columns: Natural Additions, Man-made Additions. References are given... 1) Current Greenhouse Gas Concentrations (updated October, 2000) Carbon Dioxide Information Analysis Center (the primary global change data and information analysis center of the U.S. Department of Energy) Oak Ridge, Tennessee. However, no such charts are found. Question: Are the Oct. 2000 charts depicted from CDIAC at this geocraft.com page accurate? And if so, why are these values not shown in the updates? (9/30/09)

A | Dr. Tow: Relationships between researchers' conclusions and what is stated on the site you linked me to are slim at best. You may wish to review our "Recent Greenhouse Gas Concentrations" Page at: http://cdiac.esd.ornl.gov/pns/current_ghg.html Or use the link on the site you linked me to, which gets you to the same place. Water vapor concentrations vary from day to day and place to place, so we do not include them; I think I will explain this next time I update the page. If you have further questions, please do not hesitate to contact me or call me at (865) 966-6365. TJ Blasing

Q | Why does level 4 data of AMERIFLUX sites Morgan Monroe, Harvard have negative GPP values? site address: ftp://cdiac.esd.ornl.gov/pub/ameriflux/data/Level4/Sites_ByName/ (9/28/09)

A | Vineet, This is probably due to their calculation of GPP as the difference between estimated ecosystem respiration and measured NEE. Negative GPP should be set to zero.

Q | I am somewhat confused by the disparate reporting of CO₂ emissions reported by the Union of Concerned Scientists (UCS) (http://www.ucsusa.org/global_warming/science_and_impact/science/each-country-share-of-CO2.html) and the data shown by CDIAC at http://cdiac.ornl.gov/ftp/ndp030/nation1751_2006.ems. For example, UCS shows 2006 emissions in metric tonnes for China = 6,017.69 or 4.58 metric tonnes per capita. CDIAC shows 2006 emissions in metric tonnes for China = 1,664 or 1.27 metric tonnes per capita. UCS shows 2006 emissions in metric tonnes for USA = 5,902.75 or 19.78 metric tonnes per capita. CDIAC shows 2006 emissions in metric tonnes for USA = 1,568,806 or 5.18 metric tonnes per capita. The CDIAC 2006 data for the USA shows the various components making up total emissions, but that total appears to exclude emissions from 'Bunker Fuels' of 37,364 tonnes. No explanation for this exclusion is given. I would be grateful for your advice on the reason for these disparities, please. Kind Regards, Mike Pope (9/27/09)

A | Mike, First question: UCS uses carbon dioxide, which includes the oxygen molecule of molecular weight 32. We just include the carbon atom, atomic weight = 12. $(12+32)/12$ is the conversion factor = 3.67. That is, multiply our numbers by 3.67 and you should be close to theirs. We just track the carbon atom, which changes molecular partners from hydrogen in the fuel to oxygen after combustion and back to hydrogen and oxygen in sugars produced by photosynthesis, etc. Second question: International bunker fuels are fuels used in international commerce. For example, a ship leaves New York, taking passengers or goods to London. To which country is this carbon charged? At present, they are not charged to any country, but are still tracked as a source of atmospheric CO₂. TJ Blasing

Q | Dear Sir or Madam, do you have the number of the total emission of CO₂ and the per capita emission of CO₂ due to land use change per country in the year 2006? Thank you very much for your help. Best regards, Markus Steuer (9/25/09)

A | Markus, CDIAC does not have these data for 2006. For an estimate of a global total (default value of 1.5 pgC/yr), please see the 'Global Carbon Project' website: <http://www.globalcarbonproject.org/carbonbudget07/index.htm>. Dr. Richard Houghton had broken data down into continental regions, not countries, for the period of 1850-2005. You might consider contacting him directly to inquire about regional data for 2006. (r.houghton@whrc.org) Thank you for your inquiry. Sincerely, Lisa Olsen, CDIAC

Q | I am currently completing a course on statistics which includes production of coursework. I am considering an analysis of the impact of carbon emissions on climate. I have looked at the HadCRUTb dataset available from the UK Met Office Hadley Centre observations at <http://www.hadobs.org/> and wonder if you could suggest or recommend suitable sources of data for global carbon emissions, potentially for the last 100 years as the HadCRUTb dataset covers Jan 1850 to present day. Thanks, Doug (9/25/09)

A | Doug, You are not the first person to think of this, but the mechanisms and feedbacks are sufficiently complex that you are unlikely to find anything non-spurious beyond both variables having a positive trend. Temperature responds in complex ways to the amount of carbon dioxide and other greenhouse gases in the atmosphere, as well as to other factors outlined in Figure SPM2 of: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf. The amount of carbon dioxide in the atmosphere, in turn, does not always respond to fossil fuel emissions the year before, as the oceans and terrestrial biosphere take up carbon in ways that are highly variable from year to year. Forest fires can result in large amounts of carbon release to the atmosphere which are not due to fossil fuel consumption. Finally, radiative forcing from carbon that does stay in the atmosphere may show up in things like melting of ice, which has little effect on temperature in the short term, but shows up "down the line." Therefore, dynamical models of the atmosphere and careful time-series analysis, considering a wide range of mechanisms, sometimes incorporating eigenvalues of several temporally or spatially correlated variables, are necessary. Moreover, large-scale heat waves induce large electricity consumption, leading to increased fossil fuel emissions to provide the necessary electricity, so that warming leads to increased fossil fuel emissions, rather than vice-versa. It is often difficult to separate cause and effect when the two can reverse roles,

or when one effect shows up quickly as in the example I used, and the reverse relationship shows up at much longer lag times. So, I am assuming (1) this is an introductory statistics course, and (2) you might like to do something that hasn't been tried before. I would like to see if cold winters lead to increased natural gas consumption. The HadCRUT data are monthly and are broken down by hemisphere so cold winters in the Northern Hemisphere should lead to increased consumption of natural gas -- assuming that the cold temperatures show up in places where people are using natural gas for heating, which may or may not be the case. Let's find out; the emissions data you seek are at: http://cdiac.ornl.gov/trends/emis/overview_2006.html and I would be interested to know if you find anything. Another thing you might try is predicting Southern Hemisphere temperatures from Northern Hemisphere temperatures and looking at the time series of residuals. I am guessing that the residuals will be autocorrelated. Finally, during what months of the year has the temperature increased most rapidly. Again, I would try this for one Hemisphere at a time. I suspect the answer is winter. In any case, I have led you to the emissions data you sought. Good luck and let me know what you have done and how things turn out. TJ Blasing

[Doug replies back] Dear TJ, Thank you very much for your kind response. I had contacted the UK Met office, who were kind enough to suggest the HadCRUT dataset, and from there I came across Prof. Humlum's site at www.climate4you.com and the Mauna Loa CO₂ dataset. However, on review of his site he has already covered my idea in great detail, and in fact the UK BBC covered a very similar example last night. Therefore, I like your suggestion regarding whether cold winters lead to increased natural gas consumption. Both the Mauna Loa and Global CO₂ Emissions from Fossil-Fuel datasets were fairly intuitive, whereas the HadCRUT is not so on first inspection, so I have started reading the supporting paper "Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850" such that I understand the format. In addition, I need to research the scales used (weight, temp, time etc), and the appropriate functions for analysis. My background is in Internet Protocol (IP) and my interest has been sparked from research I'm completing into whether machine learning can be used for intelligent network control. <http://www.aisb.org.uk/convention/aisb09/Proceedings/PERADA/FILES/Proceedings.pdf>. Whilst many networks can be modelled using the Pareto or Poisson distribution, I wanted to ensure I could demonstrate this in my own work, however I do not have a strong statistical or mathematics background. I have therefore started an evening-based GCSE course, a UK-based exam for 15-year-old students, but available to adult learners. A percentage of the result is gained from the coursework, and this idea grew from the initial thought that this area would have large resources of reputable secondary data, and would present a good vehicle for practising the modelling mechanisms and analysis involved. I will write you with my initial findings over the coming weeks. Yours, Doug

Q 1. What proportion of increase in CO₂ is caused by human activity? 2. What is the contribution of water vapour relative to CO₂ in global warming? 3. The ideal gas law establishes a direct relationship between temperature and pressure, given the disputes about whether we are measuring rising surface temperature (heat island effect), can changes in pressure be used to independently verify temperature increases? (9/24/09)

A Ken: (1) Each year about 30 Petagrams of carbon dioxide are released to the atmosphere from fossil fuel combustion, and a relatively small amount from other anthropogenic sources; about half of this stays in the atmosphere to cause the observed increases, the rest is taken up by the oceans or terrestrial biosphere. This introduces an imbalance in the global carbon cycle. The brief answer to your question is "all." (2) Without carbon dioxide or water vapor in the atmosphere, the equilibrium surface temperature would be about 255K; the observed temperature is 288K; about 2/3 of the difference is caused by water vapor and about 1/3 by carbon dioxide. This is roughly accurate, although some other greenhouse gases in the atmosphere contribute as well. If your question refers to the current (last 30 years) global warming, it is primarily due to CO₂, as water vapor increases have been relatively small and have occurred as a consequence of warming induced by other greenhouse gases. Models account for this, although concentrations are seldom given because the water vapor concentrations in the atmosphere are so highly variable in space and time. (3) The ideal gas law relates temperature and pressure at a constant volume, but the atmosphere can expand. Sites used to estimate global near-surface temperature changes are remote from cities, and "hot spots" are not centered around cities. Instead, in general terms, maximum warming is found at high-latitude land areas in winter, as one would expect from theory and models incorporating the theory. Moreover, the amount of heat generated in cities is not sufficient to warm the earth appreciably, as you could deduce from the world energy generation figures and knowing the surface area of the earth. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q Fossil fuel CO₂ emissions. Hi there, I would like to update my interactive map - http://www.mapicture.dk/Demo/CO2_Test_ENG/. In connection with this, I would like to ask CDIAC if you could provide me with CO₂ emissions on country level for a period longer than year 2004. The purpose of the maps is non-commercial and will be used in connection with a blog reply on COP15 channel on Youtube. I will, of course, put references to source for the data on the map. Best Regards, Samo Olsen, Mapicture Aps (9/24/09)

A Dear Samo Olsen, Emissions through 2006 are available at: http://cdiac.ornl.gov/ftp/ndp030/global.1751_2006.ems. Preliminary estimates through 2007 are available at http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2006_2007.xls. Preliminary estimates through 2008 will be coming out soon. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q Hi, I am currently looking for CO₂ emissions related to different fuel types for different countries. I can find them for the UK but am having difficulty finding them for the US and other European countries. Do you have a list available, i.e. in the UK for

mains Gas the related emissions in CO₂ is 0.194kg per kWh, Electricity is 0.422 kg CO₂ per kWh. I am looking for France and the USA in particular Thanks in advance (9/23/09)

A Alar: I'm not entirely sure I understand exactly what you are looking for, but I don't think anyone here has it for France For the USA, the following site should be helpful. I apologize for the units, the USA is the only country in the world that hasn't caught on to SI. If you need help with any of the conversions please let me know. http://www.carbonfund.org/site/pages/carbon_calculator/category/Assumptions For electricity it is important to distinguish between primary energy, electricity generated and electricity delivered to your toaster. You seem to be using primary energy (the right way to do it), but the 2nd distinction is still important. For every kWh of electricity generated about 0.85 kWh is delivered to my toaster, as some of the generated electricity is bled off to run the generating station, and line losses (conversion of electrical energy to electromagnetic energy) and transformer losses further reduce the electrical energy as it moves from the generating station to your toaster. That 0.85 figure may be greater where you live as generator to toaster distances may be smaller. All for now, hope this helps TJ Blasing

Q Pls i would appreciate it very much if i can have access to this article-Keeling C.D & Whorf, T.P 2000. "Atmospheric CO₂ records from sites in the SIO Air sampling Network", in carbon Dioxide information Analysis centre Trends A compedia of Data on Global change (9/21/09)

A Dear Folasade Oderinde, Atmospheric CO₂ records from 11 sites in the SIO air sampling network (2009) can be found at: <http://cdiac.ornl.gov/trends/CO2/sio-keel.html> We appreciate your question to the CDIAc Web site. Sincerely,

Q I'm wondering why the IEA's data on CO₂ emissions from fossil fuels differs so considerably from yours? e.g., for Canada for the 1990 through 2006 period the IEA's per capita emissions runs from just above 15 tonnes to above 17 tonnes, whereas yours stays between 4 and 5 tonnes (9/21/09)

A Tony: Off the top of my head, my guess is that IEA gives emissions in terms of CO₂, while we consider carbon only. The mass of a CO₂ molecule is 3.67 times the mass of a carbon atom because the O₂ molecule is counted also, and $4.5 \times 3.67 = 16.5$ so the numbers fit. From a regulatory viewpoint, it makes sense to talk about CO₂, but carbon alone is better for those of us who study the carbon cycle. This is because carbon can have many atomic or molecular partners, for example O₂ in CO₂, but in methane the carbon atom dances with 4 hydrogens and when CO₂ gets assimilated in plants it is as C₆H₁₂O₆ or some other hydrocarbon and we have to keep track of them all. Hope this answers your question, if something isn't clear, please feel encouraged to contact me again. TJ Blasing

Q Why is water vapor not listed in 'Atmospheric Measurements of Climate Relevant Species'? do you simply have no data or information for it? Water vapor accounts for 60% of the greenhouse effect and by that should be considered a climate relevant species (9/21/09)

A Dear Ken Sinclair, We appreciate your question to the CDIAc Web site. Please see CDIAc FAQ No. 23: <http://cdiac.ornl.gov/faq.html#Q23> Also, please see some material that I sent another user with a similar question. Here are some links to various databases, research, and projects where water vapor monitoring is involved: <http://www.ncdc.noaa.gov/oa/climate/igra/index.php> http://www.agu.org/sci_soc/mockler.html <http://www.gewex.org/gvap.html> <http://www.atmo.arizona.edu/~kursinsk/WVRemoteSensingHydroCycle.htm> [http://ams.allenpress.com/perlservery?request=get-abstract&doi=10.1175%2F1520-0442\(2004\)017<2541%3AAAYCOOW%20.0.CO%3B2](http://ams.allenpress.com/perlservery?request=get-abstract&doi=10.1175%2F1520-0442(2004)017<2541%3AAAYCOOW%20.0.CO%3B2) And another response to another user: "Water vapor, because there is so much in the atmosphere, traps more heat. But the question is, is man increasing water vapor through his activities? And if we were, this could lead to more cloud formation, which would have a negative radiative feedback. Read all about such things at this expert link: http://www.netl.doe.gov/KeyIssues/climate_change3.html Here is a snippet from the above page: What is the global warming potential of water vapor? Are the anthropogenic water vapor emissions significant? Water vapor is a very important part of the earth's natural greenhouse gas effect and the chemical species that exerts the largest heat trapping effect. Water has the biggest heat trapping effect because of its large concentration compared to carbon dioxide and other greenhouse gases. Water vapor is present in the atmosphere in concentrations of 3-4% whereas carbon dioxide is at 387 ppm or 0.0386%. Clouds absorb a portion of the energy incident on light and water vapor absorbs reflected heat as well. Combustion of fossil fuels produces water vapor in addition to carbon dioxide, but it is generally accepted that human activities have not increased the concentration of water vapor in the atmosphere. However, an article written in 1995 indicates that water vapor concentrations are increasing.

[S.J. Oltmans and D.J. Hoffman, Nature 374 (1995):146-149] Some researchers argue there is a positive correlation between water vapor in the air and global temperature. As with many climate issues, this one is still evolving." Sincerely, Dale Kaiser CDIAc

Q Why is it that your tracking and reporting on global warming gases does not also track and report on water vapor when it is known that ALL anthropogenic greenhouse sources make up only 0.28% of the total greenhouse effect when water vapor is included? How do you know that CO₂ % is having an impact on the climate? Do your models consider natural variations in water vapor which dwarf the CO₂ variation? (9/20/09)

A Dear Richard Lynch, We appreciate your question to the CDIAc Web site. Yours is a good common sense question that we are hearing a lot lately. Water vapor in the atmosphere is closely tied to temperature trends, as warmer air (i.e., the global average warming we've been observing) can hold more water vapor. Please see the several passages and links that I've included below from previous correspondence on this issue. Perhaps the best/most convenient discussion is the one from the IPCC report link. Sincerely,

Dale Kaiser CDIAC ----- Please see this FAQ on our site <http://cdiac.ornl.gov/faq.html#Q23> A passage re: water vapor from an email I sent to another user: "Most of the research in developing a climatology of atmospheric water vapor involves radiosonde or satellite observations. Unlike CO₂ or CH₄, water vapor is typically expressed as a partial pressure rather than something like ppmv. As you note, geographic location, season, and altitude make water vapor pressure extremely variable, ranging from near zero to several tens of millibars (mb). For reference, mean sea-level pressure is often assigned a value of 1013.25 mb. Here are some links to various databases, research, and projects where water vapor monitoring is involved: <http://www.ncdc.noaa.gov/oa/climate/igra/index.php> http://www.agu.org/sci_soc/mockler.html <http://www.gewex.org/gvap.html> <http://www.atmos.arizona.edu/~kursinsk/WVRemoteSensingHydroCycle.htm> [http://ams.allenpress.com/perlser?request=get_abstract&doi=10.1175%2F1520-0442\(2004\)017<2541%3AAAYCOOW%20.0.CO%3B2](http://ams.allenpress.com/perlser?request=get_abstract&doi=10.1175%2F1520-0442(2004)017<2541%3AAAYCOOW%20.0.CO%3B2)" And another response to another user: "Water vapor, because there is so much in the atmosphere, traps more heat. But the question is, is man increasing water vapor through his activities? And if we were, this could lead to more cloud formation, which would have a negative radiative feedback. Read all about such things at this expert link: http://www.netl.doe.gov/KeyIssues/climate_chang3.html Here is a snippet from the above page: What is the global warming potential of water vapor? Are the anthropogenic water vapor emissions significant? Water vapor is a very important part of the earth's natural greenhouse gas effect and the chemical species that exerts the largest heat trapping effect. Water has the biggest heat trapping effect because of its large concentration compared to carbon dioxide and other greenhouse gases. Water vapor is present in the atmosphere in concentrations of 3-4% whereas carbon dioxide is at 387 ppm or 0.0386%. Clouds absorb a portion of the energy incident sunlight and water vapor absorbs reflected heat as well. Combustion of fossil fuels produces water vapor in addition to carbon dioxide, but it is generally accepted that human activities have not increased the concentration of water vapor in the atmosphere. However, an article written in 1995 indicates that water vapor concentrations are increasing.

[S.J. Oltmans and D.J. Hoffman, *Nature* 374 (1995):146-149] Some researchers argue there is a positive correlation between water vapor in the air and global temperature. As with many climate issues, this one is still evolving" And still another "Jim, I think the key here is that man-made additions of CO₂ to the atmosphere act as a perturbation or "forcing" that has extremely long-lasting effects. While other GHGs have higher global warming potentials (GWPs) (degree of forcing on a per molecule basis), it is the total forcing that counts for any of these gases. Because we are pumping >7 GTonnes per year of carbon into the atmosphere, this is easily the largest man-made forcing, estimated to be about 1.5 W/m² since 1750 by IPCC. 1.5 W/m² is actually quite significant. This type of ongoing/growing change will act to shift the earth-atmosphere system out of radiative balance. A generally accepted estimate of the system's "climate sensitivity" is about 0.75 deg C per Wm⁻² (worked out using many types of models over the years by many investigators). Also see, from the IPCC chapter: http://www.grida.no/climate/ipcc_tar/wg1/fig6-6.htm regarding the forcing due to various factors. Also, here is the link to Dr. Jim Hansen's page at the Goddard Institute for Space Studies. The page has many links to pdfs and ppt files of various articles and presentations I would refer you to the Dec. 2005 talk that got him in "trouble" with the Bush administration (it was in the news a lot) for a particularly extensive discussion of radiative balance: <http://www.columbia.edu/~jeh1/> As far as water vapor goes, all climate modelers understand that water vapor is by far the biggest greenhouse gas. It's just that near as they can tell, it has a pretty constant radiative forcing. In simple terms, it relates to what goes up must come down. More water vapor in the atmosphere (thought to likely be resulting due to warming and thus more evaporation) may not be able to be maintained because of the constant evaporation/condensation/precipitation loop, i.e., the water cycle."

Q Hello I communicated with you earlier with the following question about daily data for station 410120 (Texas). Kindly see the emails below to remember our previous discussions. Currently my question is for the 4th August 1978 the precipitation occurred for station 410120 (Texas) was 29.05, so the monthly as well as annual precipitation of that year (1978) should be more than at least 29.05. I am wondering how these values are less than 29.05. I am basically taking individual days rainfall and aggregate them on annual basis but I am getting different values for 1978. I am following these website http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn_map_interface.html Ashok (9/16/09)

A Ashok, Thanks for these revelations. Very interesting. Regarding the daily data not being reflected in monthly and annual values I think I know why, and this too is very interesting and I thank you for calling it to my attention. On the CDIAC website from which you have retrieved data, we have the recently acquired USHCN v2 "fully adjusted" (please see documentation on our site) data from our NCDC colleagues. We posted these files alone even though the other more "raw" files were not yet available from NCDC. These files are available now and we will need to acquire them and integrate them. Long story short, apparently the v2 adjusted data (and also the "FILNET" data from our previous version of HCN, still available here: http://cdiac.ornl.gov/ftp/ushcn_monthly/) throw out that large daily value because it is so amazingly anomalous. The more "raw" monthly data files from the previous version do incorporate that daily precip value. NCDC has not updated their v2 documentation yet, found here: <http://www.ncdc.noaa.gov/oa/climate/research/ushcn/> but their ftp site now does have the "raw" and "tob" data for v2: <ftp://ftp.ncdc.noaa.gov/pub/data/ushcn/v2/monthly/> (The "F52" files are the adjusted data we now distribute). I expect that these new v2 raw and/or tob data files will also reflect that daily amount. This is an interesting thing to discuss w/my NCDC colleagues. In general it seems that any detailed analysis cannot "just" use the fully adjusted data. I know this is sort of confusing. For starters, please see any and all documentation on our old (http://cdiac.ornl.gov/ftp/ushcn_monthly/) site plus the v2 sites at CDIAC and NCDC. Please keep me posted on your findings. Dale Kaiser

Q I am an undergraduate from Universiti Teknologi Malaysia I am in my final year of Industrial Mathematic course. I am researching on CO₂ emission due to deforestation by applying first order ordinary differential equation. Can I obtain CO₂ emission data from CDIAC? (9/15/09)

A Gwee Sze Yi, Please visit the following URL: <http://cdiacornl.gov/trends/landuse/houghton/houghton.html> I believe this database will have the information you are looking for. Good luck with your research. Sincerely, Lisa Olsen CDIAC

Q Question 1 Carbon dioxide is only a very small part of the atmosphere. What effect on global temperatures does the existence or concentration of the major constituents of the atmosphere (oxygen and nitrogen) have? Question 2 Does the level of CO₂ in the atmosphere have a direct relationship to global temperatures or as some scientists say that further increases in CO₂ will have a diminishing effect on warming? (9/15/09)

A Dear John Shead, We appreciate your question to the CDIAC Web site. First, let me point you to a useful link/table that will help you compare various greenhouse gases: http://cdiacornl.gov/pns/current_ghg.html Regarding the nature of CO₂ absorption, please see the following posts prepared by myself and another staff member that we prepared in answer to similar questions from users: (1) Question I am trying to figure out how close the Earth's atmosphere is to being optically saturated (in the IR) with CO₂ at 380 ppm. That is, I would like to ... I am trying to figure out how close the Earth's atmosphere is to being optically saturated (in the IR) with CO₂ at 380 ppm. That is, I would like to see a plot of the fraction of IR (leaving Earth's surface) escaping into space (say to 25 km) as a function of CO₂ concentration. I have read a number of papers that say that the absorption (greenhouse effect) depends logarithmically on CO₂ concentration. Why is this? I have no difficulty with mathematics. The more technical the better. I'm a physicist. I have John Houghton's book. I know about the HITRAN data files. Thanks a lot. Sam Werner

[Dear Sam Werner, The logarithmic part has to do with approaching optical saturation. 280 ppmv CO₂ keeps the earth about 11 degrees C warmer than it would be otherwise. The next 280 ppm (to double CO₂) would only warm us a few degrees. The calculation is made more difficult by feed-forward mechanisms. More CO₂ means more warmth which means more moisture in the air which means that the weak H₂O absorption bands in the solar spectrum will absorb more incoming light, and more outgoing heat will also be absorbed. Dew points will be higher (condensation will occur at higher temperature) to keep the heat up, so to speak. This will all lead to a reduction in the percentage of earth covered with white stuff, so more sunlight will be absorbed at the surface, etc. An additional complication is that the upper atmosphere will undergo radiative cooling. Energy in = energy out, so the decrease of heat making its way upward "to space" from the lower layers of the atmosphere is compensated by a large temperature decrease and associated reductions in upward radiation from in the upper atmosphere. Identification of this increase is complicated by changes in the ozone layer and related thermal consequences. Finally, the earth's temperature would reach a new equilibrium in which heat radiated upward from the lower atmosphere would be increased due to a higher temperature. Etc. ... hope this helps. This is as brief an overview as I could compose of a subject which is now occupying several hundred scientists full-time. We appreciate your question to the CDIAC Web site. Sincerely, T.J. Blasing]

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Answer by T.J. Blasing: Dear Sam Werner, The logarithmic part has ... Dear Sam Werner, The logarithmic part has to do with approaching optical saturation. 280 ppmv CO₂ keeps the earth about 11 degrees C warmer than it would be otherwise. The next 280 ppm (to double CO₂) would only warm us a few degrees. The calculation is made more difficult by feed-forward mechanisms. More CO₂ means more warmth which means more moisture in the air which means that the weak H₂O absorption bands in the solar spectrum will absorb more incoming light, and more outgoing heat will also be absorbed. Dew points will be higher (condensation will occur at higher temperature) to keep the heat up, so to speak. This will all lead to a reduction in the percentage of earth covered with white stuff, so more sunlight will be absorbed at the surface, etc. An additional complication is that the upper atmosphere will undergo radiative cooling. Energy in = energy out, so the decrease of heat making its way upward "to space" from the lower layers of the atmosphere is compensated by a large temperature decrease and associated reductions in upward radiation from in the upper atmosphere. Identification of this increase is complicated by changes in the ozone layer and related thermal consequences. Finally, the earth's temperature would reach a new equilibrium in which heat radiated upward from the lower atmosphere would be increased due to a higher temperature. Etc. ... hope this helps. This is as brief an overview as I could compose of a subject which is now occupying several hundred scientists full-time. We appreciate your question to the CDIAC Web site. Sincerely, T.J. Blasing

(2) Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports

<http://ipcc-wg1.ucar.edu/wg1/wg1-report.html...radiationmainlydealtwithinChapter2>. Page 140 hits the mark where you want it to. Sincerely, Dale Kaiser CDIAC

Q I once saw that 1 lb of CO₂ at normal temperature and pressure would fill 115 two liter bottles. Can you tell me if this is true and how the answer is calculated. Thank you. (9/15/09)

A Lydia: From Avogadro's law (see link below) <http://www.chemistry.co.nz/avogadro.htm> We see that 1 lb (=454 grams) X (22.4 Liters/44 grams) = 231 liters, which is about 2 times 115 liters. The 44 is the molecular weight of CO₂. If you have any further questions please feel encouraged to check back. TJ Blasing

Q Question I found a nice and informative picture at http://cdiac.ornl.gov/epubs/ndp/ndp058_a/CO2_map95.jpg The picture is from 1995. Is there a newer one, at your site or perhaps somewhere else? Or perhaps a time-series of pictures? I have searched the Internet and your site for this, but in vain... (9/15/09)

A The generic answer to your question is, "no." but better maps will be coming out soon. TJ

Q I am the ENERGY STAR Program Manager at EPA Region 4 and also a technical contact for Climate Change. I am trying to obtain a mpg-1 or WMV file of the 'seasonal carbon dioxide flux video' that I saw on the Wired site to use in powerpoint presentations. I noticed that your logo was on the video. (9/12/09)

A Dear Danny Orlando: We appreciate your question to the CDIAC Web site. Probably your best bet would be to google "carbon tracker". That failing, send me an e-mail at blasingtj@ornl.gov. Sincerely, TJ Blasing

Q Dear Sir, I am working on daily precipitation data for Texas and found some very high values on daily data. Example 4 216 8 '410120' 1978 29.05 Station ID: 410120 (Texas) Year: 1978 Month: 8 Day: 4 Precipitation amount: 29.05. Kindly let me know if the above amount of precipitation is correct as this looks abnormal. I can remove the outliers in case if the data is not correct. Looking to hear from you. Best wishes. Dr. Mishra-- Dr. Ashok K Mishra Postdoctoral Research Associate Room no: 321E Department of Biological and Agricultural Engineering Texas A and M University Scoates Hall, 2117 TAMU College Station, Texas 77843-2117, U.S.A. Tel: 979-862-3751 Email id: amishra@tamuedu akm.pcc@gmail.com (9/11/09)

A Ah, yes, I remember that Albany, TX value myself from looking at it years ago. That value is correct, resulting from a tropical storm whose name I've now forgotten. Some Googling will probably turn that up. Here is one page that I found that verifies this amount: <http://www.wrcc.dri.edu/cgi-bin/cliRECtpl:tx0120> (Western Regional Climate Center, Desert Research Institute (it's a NOAA-related office)). Also, my NCDC colleagues who compiled these data I'm sure thoroughly vetted that value years ago. Obviously they would not "miss" it. Dale Kaiser CDIAC

Q > In discussions of the Global Warming Potential (GWP) that for water vapor > is omitted. Several reasons have been given for the omission but can a GWP > be calculated anyway? If so, what is it? (9/9/09)

A David, Good question. I think the best I can do is to give you a long list of resources that I once compiled for another user (below) and hope this is of some help. I'm not sure if I've seen a GWP computed before or not, but it would have to be highly "qualified". Regards, Dale Kaiser CDIAC ----- Please see this FAQ on our site: <http://cdiac.ornl.gov/faq.html#Q23> A passage re: water vapor from an email I sent to another user: "Most of the research in developing a climatology of atmospheric water vapor involves radiosonde or satellite observations. Unlike CO₂ or CH₄, water vapor is typically expressed as a partial pressure, rather than something like ppmv. As you note, geographic location, season, and altitude make water vapor pressure extremely variable, ranging from near zero to several tens of millibars (mb). For reference, mean sea-level pressure is often assigned a value of 1013.25 mb. Here are some links to various databases, research, and projects where water vapor monitoring is involved: <http://www.ncdc.noaa.gov/oa/climate/igra/index.php> http://www.agu.org/sci_soc/mockler.html <http://www.gewex.org/gvap.html> <http://www.atmos.arizona.edu/~kursins/WVRemoteSensingHydroCycle.htm> [http://ams.allenpress.com/perlsery?request=getabstract&doi=10.1175%2F1520-0442\(2004\)017<2541%3AAAYCOOW%20.0.CO%3B2](http://ams.allenpress.com/perlsery?request=getabstract&doi=10.1175%2F1520-0442(2004)017<2541%3AAAYCOOW%20.0.CO%3B2)" And another response to another user: "Water vapor, because there is so much in the atmosphere, traps more heat. But the question is, is man increasing water vapor through his activities? And if we were, this could lead to more cloud formation, which would have a negative radiative feedback. Read all about such things at this expert link: http://www.netl.doe.gov/KeyIssues/climate_change3.html Here is a snippet from the above page: What is the global warming potential of water vapor? Are the anthropogenic water vapor emissions significant? Water vapor is a very important part of the earth's natural greenhouse gas effect and the chemical species that exerts the largest heat trapping effect. Water has the biggest heat trapping effect because of its large concentration compared to carbon dioxide and other greenhouse gases. Water vapor is present in the atmosphere in concentrations of 3-4% whereas carbon dioxide is at 387 ppm or 0.038%. Clouds absorb a portion of the energy incident sunlight and water vapor absorbs reflected heat as well. Combustion of fossil fuels produces water vapor in addition to carbon dioxide, but it is generally accepted that human activities have not increased the concentration of water vapor in the atmosphere. However, an article written in 1995 indicates that water vapor concentrations are increasing.

[S.J. Oltmans and D.J. Hoffman, Nature 374 (1995):146-149] Some researchers argue there is a positive correlation between water

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Regards,
Dale Kaiser
CDIAC

Q I am a student doing my masters in delhi india. I am looking for CO₂ concentration data of india (mumbai) for last 100 years for my project. Can you mail me the data (9/9/09)

A Carbon dioxide measurements were begun at Mauna Loa Hawaii and the South Pole during the late 1950s. The nearest monitoring sites to India that I am aware of are 2 sites in Kazakhstan (record begins in 1997) and one in the Seychelles (record begins in 1980). The flask sampling network maintained by the National Oceanic and Atmospheric Administration is at: http://www.esrl.noaa.gov/gmd/Photo_Gallery/GMD_Figures/ccgg_figures/tn/ccggmapping.html I can direct you to available data. T.J. Blasing

Q I am writing a report on 2008-2009 GHG emissions and wondering how soon you will post updated emissions data: global, by sector, etc. My report is due at the end of this month. Would it be possible to talk with someone by phone about the data? Thank you (9/9/09)

A Data through 2006 are on our web site. Here are preliminary data for 2007 and 2008. These data will be released publicly on 14 September. Data for 2009 should be available next July. I should be available at 865-241-4850 all day tomorrow if you have questions about the data. Gregg

Q What is known about the diffusion rate of CO₂ through ice? Was any type of correction made to the samples from the Vostok ice cores? How closely does the current atmospheric CO₂ levels measured at Vostok match the current CO₂ levels measured at Mauna Loa Observatory? (9/9/09)

A For your first question, the attached article gives a lot of detail and references. While CO₂ is not measured continuously at Vostok, it is measured at the South Pole. Antarctic values generally lag Mauna Loa by about a year, as it takes time for the CO₂ to diffuse from the Northern Hemisphere. A word of caution, the ice-core data represent integrated values over several decades. Air diffuses very nicely through the freshly fallen snow, and it takes time to build up a leak-proof layer of ice. T.J. Blasing Building 1509, Mail Stop 6335 Oak Ridge National Laboratory Oak Ridge, TN 37831 Phone: (865) 574-7368 FAX: (865) 574-2232 E-Mail: blasingtj@ornl.gov

[T] attached PDF "EPICA8GICy.pdf"

Q Hi Som, Thanks for the note. There are a couple of local sources of information on weather/ climate data for the Oak Ridge, TN area: Walker Branch Watershed <http://walkerbranchornl.gov/> NOAA Atmospheric Turbulence and Diffusion Division in Oak Ridge <http://www.atdd.noaa.gov/?q=node/20> I'm also copying Dale Kaiser, who works with the NOAA group in Asheville, NC (NOAA National Climatic Data Center). Dale is a good resource. Please let us know if you have any questions. Best wishes, Bob
From: Hughes, Lee Ann Sent: Tuesday, September 08, 2009 8:05 AM To: Cook, Robert B. Cc: Beaty, Tammy Walker Subject: FW: Weather Data
From: Shrestha, Som S. Sent: Friday, September 04, 2009 2:15 PM To: Hughes, Lee Ann Subject: Weather Data
Lee Ann, I am not sure who to contact in Environmental Science Division, so I am sending this request to you. Would you please forward it to appropriate personnel in the group? I am looking for weather data of Oak Ridge area. In particular, global, beam and diffuse solar irradiance. Does anybody in Environmental Science Division collect those data? If so, can I gain access to the data? Thank you for your help. Som Shrestha, PhD Building Technologies Research and Integration Center Oak Ridge National Laboratory shresthas@ornl.gov 865-241-8772 (9/8/09)

A Hello Som, Bob Cook had copied me on an email to you about Oak Ridge solar radiation data several days ago and I wanted to chime in. While I don't know of any real data for Oak Ridge as part of the auto. obs. taken in town at NOAA's ATDD (please fill me in if you found any!), I would like to point you to the National Solar Radiation Database if you are not familiar with it: http://rredc.nrel.gov/solar/old_data/nsrdb/ I have not dug very deep into this, but I notice early in this report: <http://www.nrel.gov/docs/fy07osti/41364.pdf>, linked to from the main page, the statement "Nearly all of the solar data in the original

NSRDB and this update were produced using solar radiation models. Less than 1% of the records in this update contain measured data." Still, I would think that the modeling is often pretty good since it ingests many types of met data, etc. Best wishes, Dale Kaiser ORNL/ESD

Q This relates to FAQ 22. Exactly how much energy is required to separate carbon from oxygen in CO₂? If it took say two thirds of the energy a coal fired power station produces to then convert the CO₂ to carbon and oxygen wouldn't that be worth it for the sake of the environment? Is there any research currently being undertaken to discover ways to separate carbon from oxygen on an industrial scale that uses minimum energy? I wondered whether microwaves, lasers or nuclear energy could be used in some way? (9/8/09)

A Dear dtichen, We appreciate your question to the CDIAC Web site. The problem here is in the laws of thermodynamics rather than the chemical bonds. The first law says you don't get something for nothing and the 2nd law says you can't break even. Generating electricity from steam coal involves the Rankine Cycle, which is not as efficient as the Carnot cycle, etc. Sincerely, TJ Blasing

Q Hi I am a journalism student writing an article on climate change. I was hoping to get some facts and figures regarding the amount of CO₂ and other greenhouse gases being emitted into the atmosphere globally. Also how quickly the levels are increasing since the industrial revolution (9/4/09)

A Dear David, We appreciate your question to the CDIAC Web site. Sorry that I lost track of this mail and did not respond sooner. There are a handful of primary sources that will let you do a good job with this topic. I'm sure you've Googled a bunch of them, but I'll give you my opinion on the most authoritative ones. The Granddaddy of them all: <http://scrippsCC2.ucsd.edu/home/index.php> The Intergovernmental Panel on Climate Change <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> See esp. Chapter 2. Sincerely, Dale Kaiser CDIAC

Q Dear Sir or Madam, Currently I am developing a research about GHG emissions from Hydropower energy. I have been looking for information about this in the web site, but I could not find anything. I need to find information of dams and water reservoirs GHG emissions in tropical countries and I would be really pleased if you could send to me some bibliography reports and scientific researches that you know in this issues. Thank you very much in advance. Best regards, Javier Garc a (9/2/09)

A Javier, CDIAC no longer maintains bibliographic data sets so we will not be much help to you in this search. I can tell you that there is now a considerable body of research on methane releases from hydrologic dams so you should have success in finding references. Much of the work with which I am familiar comes from Brazilian scientists. Gregg

Q I lecture frequently regarding green and sustainable construction. May I have permission to use in my power point presentation one of your graphics titled "Global GHG Emissions (1) Geographic distribution (2) Atmospheric concentrations". At the bottom of the graphic, it is attributed to CDIAC. (9/1/09)

A Dear Bryan Jackson, We appreciate your question to the CDIAC Web site. Thanks for being considerate regarding attribution. All of our information can be used in whatever way the user wishes, but we like to have attribution emphasize the true provider of the data. A lot of our pages make it easy via a "cite as" block. Where that is not available, please emphasize authors. Here are a few examples: http://cdiac.ornl.gov/trends/emis/overview_2006.html ...has a "cite as" block at the bottom. As does: <http://cdiac.ornl.gov/trends/CO2/sio-mlo.html> <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> ...would be Menne et al. at the top of the page. Sincerely, Dale Kaiser CDIAC

Q nowadays I am working on my masters thesis entitled "Atmospheric carbon dioxide measurement in Thailand by using satellite remote sensing". I just want to know about the available methodology for measuring atmospheric carbon dioxide by using satellite remote sensing (8/31/09)

A Perhaps you could start by doing internet searches (ie: Google) on "GOSAT" and "Orbiting Carbon Observatory". GOSAT is a Japanese satellite that is measuring atmospheric CO₂ now and OCO is a US satellite that failed earlier this year, but has lots of material on its website and may be reflown in 2 or 3 years. Good luck with your research. Sincerely, Lisa Olsen

[Uday responds] Dear Lisa, Thank you very much for email. Actually I have enough information about ENVISAT- SCIAMACHY and GOSAT-IBUKI, because nowadays these two satellites have a capability to measure the greenhouse gases. By using SCIAMACHY we can calculate the vertical profile of carbon dioxide (WFM-DOAS), but still there are many questions in my mind regarding processing of data. One main disadvantage of this data is it is available for only 2003-2005. First I was thinking that, I will use 2008 data for processing and compare the accuracy of result with GOSAT-IBUKI. Regarding GOSAT data I am talking with JAXA people, but maybe it takes long time. If you don't mind then can you tell me which satellite data you are using for measuring atmospheric carbon dioxide? If you are working with the same satellite then I have some questions to ask you. And if you know some person who is working in the same field then please send me his contact details. I would be very grateful if you help me. Again thanks for email. Kind regards Uday

[Lisa responds back] Uday, CDIAC is not working directly with the satellite data you describe. It sounds as though you have been in touch with all of the right people, and you'll need to work directly with the people at JAXA and JPL for specifics. Good luck in your research. Sincerely, Lisa Olsen CDIAC

Q In your FAQ section, you mentioned that we do not care about water. According to an article put out by NASA on November 17, 2008 water vapor could affect climate change by twice the amount of CO₂. http://www.nasa.gov/topics/earth/features/vapor_warming.html Why should we not be concerned about water vapor since it is also a greenhouse gas? (8/31/09)

A Dear Nathan Mentzer, We appreciate your question to the CDIAC Web site. Our FAQ no. 23 does address water vapor as an important factor (linking to the more involved IPCC discussion). There are two ways to look at it though: 1) "change" or increases in actual human-produced water vapor are very small, thus it is not a significant driver of additional greenhouse effect. 2) human-induced strengthening of the greenhouse effect via emissions of CO₂ and other greenhouse gases are likely raising temperatures which then has the effect of increasing water vapor in the atmosphere because a warmer air can hold more water vapor. This is the POSITIVE water vapor feedback effect referred to in the NASA article you cite (thanks) and in the IPCC matter that our FAQ links to. So to summarize, increased water vapor is very important but it occurs as a RESULT of anthropogenic warming through CO₂ and other emissions. CO₂ emissions are the main factor which gets the ball rolling. Sincerely, Dale Kaiser CDIAC

Q Can we use the data from CDIAC in class room or research presentation? (8/28/09)

A Dear Mohd Bismillah Ansari, We appreciate your question to the CDIAC Web site. All of the CDIAC data are available for whatever application one desires. We only ask that in using particular datasets that the principal investigators are cited and credited, e.g., in the case of the data here: http://cdiac.ornl.gov/trends/emis/tre_glob.html The Boden et al. citation at the bottom of the page should be used. Sincerely, Dale Kaiser CDIAC

Q Dear Sirs I am currently producing a third level end of course assessment project as part of my Open University studies towards a BSc (Hons) in Natural Science. My current course is U316 The environmental web. The project is in the form of a website which will be published only on my personal area of the Open University's website, accessible only to the markers and which will not be available for public consumption. I have chosen the subject of carbon capture and storage and will need some illustrations and graphics to accompany my text. On researching the subject I came across your site and found a graph showing global CO₂ emissions I need to obtain permission to use any images and I would like to ask if I may be permitted to potentially use the graph to illustrate my project. The image is the graph entitled "Global emission estimates" on <http://cdiac.ornl.gov/trends/emis/glo.html>. I would appreciate any permission you can let me have for this, and would be happy to credit you in any way necessary. I look forward to your reply. Yours faithfully Mary Avis (8/27/09)

A Mary, we are pleased that you find our graphic useful. The material is in the public domain and you are welcome to use it. Citation is appreciated and the following is suggested: Boden, T.A., G. Marland, and R.J. Andres. 2009. Global, Regional, and National Fossil Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001

Q where can i find details of methods used to measure the amount of carbon dioxide which is present in the troposphere how often is this done and with what accuracy? (8/27/09)

A Dear Keith Martin, We appreciate your question to the CDIAC Web site. Simply go here to the Granddaddy of all CO₂ measuring programs <http://scrippscc2.ucsd.edu/home/index.php> Sincerely, Dale Kaiser CDIAC

Q How can I calculate CO₂ emission due to iron ore mining activities as follows: 1) Mining and beneficiation of 25 Mt/y of magnetite ore (final product is pellet feed) 2) Logistics: the final product is transported by railway (around 500 km), reaching the port. (8/27/09)

A What you ask is a significant research question. And the answer will vary by location because, for example, different locations will use a different mix of electricity sources. I will send you as a separate e-mail the paper that we have written on emissions for different agricultural practices and I think you will easily see the approach that we have taken and some of the needed information. Best wishes, Gregg

[from Themis] Dear Gregg Thanks for your prompt response. Best Regards, Themis Lima

Q I am a Phd candidate working on air quality control in Ghana I just came across your data on carbon dioxide emissions and was wondering if i could use part of the data for my analysis and reference the data source as CDIAC? Looking forward to hearing favorably from you. (8/27/09)

A Dear Betty Brew, We appreciate your question to the CDIAC Web site. All our data are freely available for anyone's use. We ask that the true PIs receive attribution for the data wherever possible, e.g., on the following page, see the "Cite As" section at the bottom http://cdiac.ornl.gov/trends/emis/overview_2006.html Sincerely, Dale Kaiser CDIAC

Q What is the relationship between infrared absorption and CO₂ concentration in the atmosphere? Will infrared absorption increase linearly with CO₂ concentration as CO₂ increases from current levels or is it a non-linear relationship? If it is non-linear, please describe the relationship (8/24/09)

A Dear Alan Leviton, We appreciate your question to the CDIAC Web site. Short answer to your question... non-linear. I'm going to paste in a response to this excellent question from my answer to another user on the same track. Thanks for your question and I hope this info. helps. Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmos. radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website, specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> ...radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Happy reading. Regards Dale Kaiser CDIAC

Q Thank you for providing such a wide range of data as to greatly facilitate our research! I am a graduate student from Peking University and currently involved in a research project about global carbon emissions. The database provides CO₂ emissions from land use change annual time series from 1850-2005 by ten regions. However, no indications were provided on how the ten regions were divided. I read Mr. RA Houghton's paper in 1983, 1999, and 2003 and try to find out but failed. I think it may be found in Houghton's 1995 paper "Continental Scale Estimates of the Biotic Carbon Flux from Land Cover Change 1850-1980" but I couldn't get it from our library. So, would you please kindly tell me who the ten regions are divided and if inappropriate give me the paper published by Houghton et al., in 1995? With all my thanks and Best Regards (8/21/09)

A Yue Chao: See if this (attached) helps TJ

[TJ sent ndp050.pdf]

[from Lisa] Yue Chao, I have attached a pdf file of the paper you referenced in your inquiry. I hope the paper will be useful in answering your questions. Sincerely, Lisa Olsen CDIAC

[Lisa attached ndp050.pdf as well]

Q Hello I am trying to find what the 10 hottest overnight temperatures have been in New York. I am also interested in the 10 hottest low temperatures that have been recorded in New York. Thank you, Jim (8/21/09)

A Jim, The two temps you ask for are basically one and the same in meteorological parlance, unless I'm missing what you're asking. That is, since the low typically occurs a maybe 6 or 7 in the morning in that area, a record "high minimum" is pretty much indicative of record high temps overnight too. I'm going to send you "several links in" to the interface that provides these data. Go to: http://cdiac.ornl.gov/epubs/ndp/ushcn/state_NY.html And click on the NY Central Park locator (I'm assuming you mean NYC, not NYS). On the page that lets you do lots of plotting and data downloading, scroll down near the bottom and download a file of minimum temperatures. Then you can use whatever software you want to find the 10 warmest. Right now the data only extend through 2005, but literally within days, if you visit <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html> and drill down you should see data extending through 2008 and be able to download it in the same way. Regards, Dale Kaiser CDIAC

Q The fossil CO₂ emissions are measured in "thousand metric tons of carbon". Does this mean that you only measure carbon or is it carbon dioxide? Thank you for your answer and kind regards (8/18/09)

A Reto: We just track the carbon atom; this is the most useful procedure for carbon-cycle studies that follow carbon as it changes molecular partners going from carbohydrates in fuels to CO or CO₂ in the atmosphere to simple sugars via photosynthesis etc. To also include the mass of the oxygen molecule in CO₂, just multiply the carbon by 3.67, or 44/12. TJ Blasing

Q Is it feasible to separate carbon dioxide from air based upon density, either using a centrifuge or simply a tall chimney? (8/17/09)

A Carbon dioxide (one carbon, 2 oxygens) has a molecular weight of 44. The most abundant chemical species in the atmosphere is nitrogen, which exists in the air as N₂ (2 nitrogen together as a molecule). The molecular weight of N₂ is 28. So carbon

dioxide is slightly more dense than the average of air. There are instances where the carbon dioxide settles and preferentially collects in pockets and these have led to some deaths, and people do worry about this when they propose to collect and store CO₂. But I am not aware of anyone using this for a purposeful and efficient separation. There has been some work on separating CO₂ from the other ingredients of air with diffusion through membranes, but it is not very efficient. Not a very comprehensive answer I am afraid, but this is the limit of my knowledge. Gregg

[from Terry] Thank you, Gregg, for your fast reply. Do you know if you flow air through water whether the carbon dioxide becomes entrapped (carbonated water) and the rest of the air passes through? Terry

Q I see from your web site that a data set of atmospheric CO₂ data from the South Pole is available that covers the period 1957-2007. The data was collected by: R.F. Keeling, S.C. Piper, A.F. Bollenbacher and J.S. Walker, Scripps Institution of Oceanography, University of California, La Jolla, California 92093-0244, U.S.A. Can you tell me if this sampling program is continuing and if so whether more recent data is available. Thank you for attention. Jon Huddleston (8/16/09)

A Dear Dr. Jon Huddleston, We appreciate your question to the CDIAC Web site. I'd be very surprised if measurements were not continuing. Please see the Scripps site for the latest and any contact info. <http://scrippsCC2.ucsd.edu/data/spo.html> Sincerely, Dale Kaiser, CDIAC

Q METHANE is converted in the atmosphere to other GHG gases, not CO₂. Do we have any idea how much cumulative CO₂ has been caused by this methane to CO₂ conversion? (8/13/09)

A Peter, Sorry for the delayed response to your question (reproduced below). I am forwarding it to Ed Dlugokencky at the Earth System Research Laboratory. TJ

Q HI, I'm doing some research into the residence time of carbon in the atmosphere. In your qa page you list the carbon residence time of 3.5 years and a 'sliding scale' so to speak of how long the extra carbon in the atmosphere would take to be removed. Can you link me to a more detailed analysis of how these figures were reached? I know you must get a ton of inquiries such as these and really appreciate your time. Mark Swanson, PS Feel free to call if it's easier. (8/12/09)

A Mark: The answer in the FAQ section needs revision and I haven't had time to do that yet. CO₂ goes back into the biosphere on a time scale of around 5 years, but it comes back again when termites decompose dead trees and the like and exhale CO₂. So CO₂ hangs around in the atmosphere-biosphere system for about a century or two before it gets absorbed in the ocean and the carbonate rock cycle takes it away from there. However, the oceans can only absorb so much CO₂ before the carbonate rock cycle can't remove it any faster than it is accumulating; the oceans become "saturated" so they don't remove much CO₂ from the atmosphere any more. This point is indicated by the big red dot on the attached diagram, given as a couple of centuries from now. The carbonate rock cycle performs slowly, so removal from the atmosphere is slower when the carbonate rock cycle becomes limiting. Eventually, the carbonate rock cycle cannot take up any more carbon and the "silicate rock cycle" becomes limiting. So, what is the residence time of atmospheric CO₂? We give the "e-folding" time of about 100 years in our "Recent Greenhouse Gas Concentration" page. http://cdiac.ornl.gov/pns/current_ghg.html There is some more information about how that was obtained in footnote 4 on that page. TJ

[TJ attached Carbon removal.doc]

Q > Hello >> Is there a source of information that will help me understand the > results of actions taken to reduce greenhouse gas emissions? I'm not > looking for modelling. I'm looking for something that tells me costs and > benefits. For example, if I install compact fluorescents in an office > building of a certain square footage, it will cost x and reduce > emissions by y, or if I replace the windows with a certain level of > efficient windows, the cost will be this and the reduction will be that. >>> I understand that these would have to be generalized, but some rule of > thumb guidelines would be helpful in decision making >> Thanks >> Drew >> Drew Shaw, AICP > Chief, Environmental Planning > Montgomery County Planning Commission >> (610) 278-3733 > dshaw@mail.montcopa.org (8/12/09)

A Hi, I would start with this DOE Energy Efficiency and Renewable Energy website. I'm sure there are lots of other sites that have been built, but start with what DOE has to offer. They should have the best info, I'd hope. Although I don't know right off a site that extends an action like increasing the energy efficiency of X windows into X tons of CO₂ emissions per year. That sort of thing can be calculated by starting with the KW hours saved over a period of time and then researching the source of your electricity and doing calculations involving coal, oil, gas, etc. Here is one related example along those lines: <http://cdiac.ornl.gov/faq.html#Q17> Dale Kaiser, CDIAC

Q Hi, one of our users submitted the following question. Since this is one of your data sets, would you be able to assist? Thank you, Scott. In the dataset Historical Isotopic Temperature Record from the Vostok Ice Core (Entry ID: CDIAC_VOSTOK_TEMPS_TRENDS) The tabulated data show the annual temperature variation relative to the mean annual surface temperature for

Vostok (-55.5 C). I would like to know how and over what years the mean annual surface temperature was calculated to get a value of -55.5 C. (8/11/09)

A Dear Scott, We appreciate your question to the CDIAC Web site. The mean temperature for Vostok that you mention is also quoted in the landmark paper on the ice core: Nature 399, 429-436 (3 June 1999) | doi:10.1038/20859; Received 20 January 1999; Accepted 14 April 1999 "Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica" They don't cite the source of the temp mean in the paper though. However, another CDIAC dataset for Antarctica <http://cdiacornl.gov/epubs/ndp/ndp032/ndp032.html> discusses that for many Antarctic stations there were several sources of data that were combined and cross checked. "In some cases there were four sources of data, but more often two or three. For each station, the sources were cross checked against each other.... Where data sets overlapped, these were automatically checked for consistency." Please see Section 2. of the above web page for more discussion. The data that are part of the above NDP032 dataset show Vostok temperatures from 1958 through the mid-1990s, with some missing annual values. (See <http://cdiacornl.gov/ftp/ndp032/tmean.dat>, station 89606) Annual temp. deviations for Vostok are not very great, certainly much smaller than the fluctuations seen in the ice core over the millennia. Anomalies are much "safer" to use than actual temperatures when describing change. At any rate, I hope this gives some helpful background. Sincerely, Dale Kaiser CDIAC

Q Where are the measuring stations for atmospheric CO₂ and are they affected by local emissions? (8/10/09)

A A map of CO₂ monitoring stations is attached. This is not a complete list, and it includes some stations which have been discontinued, but it will give you an idea. The stations are at remote sites in places where a nearby source that could possibly affect CO₂ values exists; measurements when the wind was from the direction of that source are not included in the CO₂ determinations.

Q May you set me the value of the reference value (average 1961-1990) that is subtracted to compute the temperature anomaly tables published by Jones et al. Many thanks for your answer to my request. (8/9/09)

A Dear Silvia Duhau, We appreciate your question to the CDIAC Web site. Phil Jones tells us that the 1961-1990 global average temperature from his database is 14.0 C (NH 14.6 and SH 13.4). I should add this info. to the web page. I thought that I had already done it! Thanks very much for the question. Sincerely, Dale Kaiser CDIAC

Q I've read that the current concentration of atmospheric CO₂ by volume is about 380 parts per million, or about 0.03% by volume. Apparently the earth's atmosphere is largely comprised of Nitrogen (78%), Oxygen (21%), and Argon (0.93%). So, how can a gradual increase in the tiny amount of CO₂ present in the atmosphere be contributing to climate change? (See e.g. <http://climatesanity.wordpress.com/2009/04/18/kyotos-impact-on-atmospheric-CO2/>) (8/8/09)

A Your chemistry is right on target. But of those gases only carbon dioxide absorbs infrared radiation. It is amazing that a tiny aspirin can cure a headache and a tiny concentration of carbon dioxide can change the energy balance of the atmosphere.

[from TJ Blasing] Ian: Nitrogen, Oxygen, and Argon do not absorb radiation in the principle wavelength that the earth emits, but carbon dioxide, water vapor, and several other gases do. Among the absorbers, water vapor is the most prevalent and it can get up to around 3% of the total molecules in a cubic meter of air on a humid day, but that's pretty much an upper limit and it is usually much less. It is these absorbing gases that contribute to the earth's radiation budget, and thereby influence the earth's near-surface temperature. TJ Blasing

Q How often is that following data being updated on the web: CO₂ to atmosphere from deforestation. It's on the following site and currently runs only through 2005. Thanks, Sapna <http://cdiacornl.gov/trends/landuse/houghton/houghton.html> (8/6/09)

A Sapna, We don't have a formal agreement or expectation for updates of these data. Dr. Houghton extended the data through 2005 and sent it to us in 2008. You may need to inquire directly with him about plans for future updates. Thank you for your interest. Lisa Olsen CDIAC

Q Where can I find information about the annual average atmospheric carbon dioxide concentration of Florida for the last 12 months? (8/5/09)

A <http://cdiacornl.gov/ftp/trends/CO2/maunaloaCO2> I don't know the details of what you need to know - CO₂ varies with place, time of day, proximity to cities and other large sources, etc. But as a good first approximation, the average in Florida will not be very much different than the average at Mauna Loa Observatory in Hawaii. The data for Mauna Loa are at the web site shown above.

Q How often is the CO₂ data from Mauna Loa updated on your website? (8/5/09)

A Hi Sapna, I update the Mauna Loa data each year, roughly as soon as the data for the previous year are complete. We currently have data posted through calendar year 2008. It is a bit misleading to provide an annual average based for less than a 12-month

period as there is an annual cycle in the data. If you are interested in this year's portion of the annual cycle, NOAA has data thru June '09; the other site (Scripps Institution of Oceanography) is down right now, but I would doubt that they have anything more recent. Here are the NOAA (monthly mean) data for 2009: Jan 386.93 Feb 387.41 Mar 388.78 Apr 389.46 May 390.18 Jun 389.42. The downturn in June is due to photosynthetic uptake of CO₂ by the biosphere. Concentrations will continue to decrease through the summer. These data are from: Dr. Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends/) and that is the suggested citation. That link always has the latest NOAA data. I apologize in advance if I have insulted your intelligence with all the detail above, but I prefer to sin on the side of providing too much than not enough. On the other hand, if I have not provided all you need, feel encouraged to contact me again. Sincerely, TJ Blasing

Q I am working on a paper for a grad school report. I am coming up with 2 starkly different numbers from 2 different sources, perhaps you can explain why. On a report from the EPA it shows the US having CO₂ emissions of 6.1 billion tons (<http://www.epa.gov/climatechange/emissions/download09/InventoryUSGHG990-2007.pdf> (pg. 26)). Your report shows the US producing about 1.6 billion tons (http://cdiac.ornl.gov/trends/emis/meth_reg.html). Are these 2 different types of emission? (8/4/09)

A Jonathan, The numbers seem different because they are reported in different units. The EPA number is reported in million metric tonnes CO₂. The CDIAC number is reported in thousand metric tonnes C. The conversion between the two units involves the molecular weights of CO₂ (44 g/mol) and C (12 g/mol). So, taking into account the molecular weights and the change in 1000s (i.e., from thousand to million) one ends up with the equation (going from CDIAC to EPA): 1.6 thousand metric tonnes C * (44 g CO₂/mol / 12 g C/mol) * (million metric tonnes/1000 thousand metric tonnes) = 5.9 million metric tonnes CO₂. This number is close to the EPA reported value. The difference can be attributed to two main factors: 1. The EPA estimate contains additional sources and sinks than the CDIAC estimate, and 2. The reported EPA and CDIAC estimates are actually equivalent to each other when one also considers the +/- 3 to 5 % error associated with each estimate. Sincerely, Robert Andres

Q I am a graduate student in the Department of Ecology, Peking University in BEIJING, CHINA. I am very interested in climate change-related science and policy and currently doing research in Terrestrial Ecosystem Carbon Cycling. Do you have the historical yearly time series data on all the Greenhouse Gas emissions by countries in the world and over a long time (covering all the constituent GHG gases and converting to CO₂ equivalent according to GWP, with a time frame beginning from 1850 or even more earlier)? Since as we all know, CO₂ is only one component of all the gas types posing a greenhouse gas effect. Or if you don't have, could you please kindly recommend some alternative online sources where it may be available? Another question is, the CDIAC website provides per capita fossil fuel emissions of different countries and the whole world since 1950, but due to a lack of population data before 1950. Yet we really have a strong interest in examining the trend of per capita emissions over a long time frame. Could you please recommend some other resources or lines where population data (of each country or major big countries or country groups) before 1950, preferably dating back to 1850? (8/2/09)

A <http://cait.wri.org/> Our long-period data set includes only CO₂ from fossil fuel burning. As I am sure you are aware, it is not easy to assemble reliable data sets for historic periods. The web site shown above is probably the best place to get comprehensive data on all greenhouse gases. We have not explored the historic population data and I have no recommendation to make. Best of luck with your research, Gregg Marland

Q Thank you for your prompt reply. I am under the impression that ppm for the greenhouse gases (CO₂, CH₄, N₂O, Fluorocarbons, SF₆) is a solute/solvent expression, and in order to convert them to a weight, one needs the density. By using ppm, is there the implication that the gases are soluble in water vapor present in the air? My concern is with SF₆. By ppm, it is very potent. However, if the statement in Wikipedia that its density is 5 times that of carbon and that its transport in the air is not great is correct, then is ppm correct? The density of air decreases with altitude and so I'm presuming a heavy gas does not transport very far up? Is this correct? Thanks. I guess if the above is correct, I still need densities. (7/31/09)

A You may want to try: Chemistry of the Upper and Lower Atmosphere (large and expensive book) by Barbara Finlayson-Pitts and James N. Pitts Jr. Academic Press. A tip-off on concentrations: The term troposphere is from Greek words meaning sphere of tropos (overturning). Pollutants in the troposphere are usually pretty well mixed in the vertical, until you get above the troposphere to the stratosphere where very little vertical mixing takes place. TJ Blasing

Q I don't seem to have enough information to answer the following data: GWP for methane 20 years 100 years 500 years 67 23 6.9. Is it a first order reaction? If so, can I use $k = 6.93/t_{1/2}$. I've tried this and it doesn't work. I would appreciate a source. Thank you. (7/31/09)

A Are you accounting for hydroxyl reduction in the atmosphere when large amounts of methane are released (see page 552 of: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf)

Q Your CDIAC FAQs Q&A is very good and especially interesting to me. Thank you for it! The answer to my below asked question may be embedded in some of your supplied answers, such as 6 and 7 and/or others. However, I pose it here simply to

get a direct one-shot percentage answer. What is the post-1850s anthropogenic-caused World "incremental" CO₂ percentage net increase by weight and by volume of the current air that I breathe today at Sea Level relative to that 1850 CO₂ datum? (7/31/09)

A The nominal preindustrial percentage (by volume) was 280 parts per million, but there are natural variations of 5-10 parts per million in that number, depending on when you define "preindustrial". Concentrations now are about 385 parts per million, so about 27% of the CO₂ today is due to anthropogenic influence

Q Hi, I was wondering if CDIAC had any data available or knew of any that showed cumulative historical GHG or CO₂ emissions broken down by country (and presented in a descending list from most to least). On your website I can find 2006 emissions levels by country (as well as preliminary 2006-7 levels), but nothing showing how much they've emitted up to 2006. I've been able to find historical global emissions as well, but they're not disaggregated by country. Thanks so much in advance for your help, and I hope this isn't just a matter of me missing a link that's before my eyes. Best, Aaron Saad (7/30/09)

A Aaron: What I would do is to convert the data on http://cdiac.ornl.gov/ftp/ndp030/nation1751_2006.ems to EXCEL. Then you can just accumulate the numbers in the totals column for any given country to make the accumulation totals. You might also see this site http://cdiac.ornl.gov/trends/emis/tre_tp20.html to help you determine the top 20 countries, but these are the current top 20 and not the temporally aggregated top 20. TJ Blasing

[and Aaron replies..] Hi TJ, I never thought of that. I'll try it out. Thanks for the suggestions. Best, Aaron Saad

Q How come you do not list Water Vapor as The Principal Green House Gas proving 95% of the Global Warming that we need to survive against the cold vacuum of outer space? Ronald (7/30/09)

A Dear Ronald, Thanks for your question to the CDIAC Web site. I assume your question/comment refers to our quick greenhouse gas summary at http://cdiac.ornl.gov/pns/current_ghg.html. We certainly did not intend to slight the importance of water vapor as a greenhouse gas in the table. It is certainly the key greenhouse gas in terms of moderating climate. We do not include water vapor in the table since direct tropospheric and stratospheric measurements are not made, only measurements of related gas species like the OH radical which are also very difficult to estimate and short-lived. Our archive does provide lots of continuous surface-level flux measurements of water vapor (e.g., AmeriFlux) but to summarize surface-level measurements into a single value for the table would be virtually meaningless given the variability (time of day, season, in what type of land cover, etc). Maybe we should consider some sort of model output summary addressing tropospheric water vapor since all biogeochemical and general circulation models account for evaporation, transpiration, evapotranspiration, and condensation. Again, thanks for your comment. We'll consider simply adding water vapor to the table without values but with relevant footnotes and links, or inclusion of a water vapor-related parameter to avoid others from thinking we're deliberately omitting water vapor or don't recognize its importance. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q To whom it may concern, I am attempting to download the files of the yearly mean temperature and precipitation data from each of your measurement sites for all the recorded years. I believe that data is contained in the file "hcn_doe_mean_data.Z". I downloaded that file directly from your web site " <http://cdiac.ornl.gov/epubs/ndp/ushcn/ndp019.html#obtain>" but could not open it since I do not have the UNIX COMPRESS utility. Your web site says "These files have been compressed using the UNIX compression utility compress. If this utility is not available, leave off the .Z extension and the files will uncompress on the fly through ftp ". I can not seem to make this procedure work. It does not work directly through your web site so I went to your FTP site " http://cdiac.ornl.gov/ftp/ushcn_monthly/" and found the file. However, I still could not get the file to decompress by eliminating the ".Z" extension. What am I doing wrong? Thanks for your help. George Kizer (7/29/09)

A Hi George, Sorry for your trouble in uncompressing the file you speak of. Rather than go through details on fixing things as you had referred to them, what do you say we start over fresh? We have some updated USHCN data. Our pages do not link to them yet, but we expect to link very soon. (Please keep things under your hat until you notice being able to get to these data by starting at the CDIAC homepage) In the meantime let me point you to just where you need to go to get the type of data you want: 1) Go to the new USHCN homepage <http://cdiac.ornl.gov/epubs/ndp/ushcn/ushcn.html>. These data are now updated for most stations through 2008. From this page, click on Data Access. Next, take a look at the "monthly documentation" link, to be sure you understand the nature of the newest USHCN release. (BTW, daily data through 2008 are not yet available.) After looking at the documentation from the previous page, under "FTP", click on the "Monthly Data" link. The file that you want, basically like the one you had mentioned is "O9641C_200904_F52.avg.gz". The gz means it's compressed using gzip, rather than "compress". That file can be unzipped using the Winzip self-extractor program available under the Download tab at <http://www.winzip.com/index.htm>. Let me know if you need further help. BTW, check out the user interface for indiv. station data by clicking on "Web Interface" on the Data Access page: <http://cdiac.ornl.gov/epubs/ndp/ushcn/access.html>. Regards, Dale Kaiser CDIAC

Q Hello, We would like to use a figure from your website's Land Use and Ecosystems section for our (World Bank Environment Department) upcoming publication titled "Convenient Solutions to an Inconvenient Truth: Ecosystem-based Approaches to

ClimateChange" Please let us know about how to get permission for reproduction of the figure. Best Regards Junu Shrestha For Kathy Mackinnon Environment Department The World Bank (7/29/09)

A Junu, Specifically which figure are you intending you use? The Land Use and Ecosystems section contains several different data sets and corresponding figures. Thanks, Lisa Olsen CDIAc

Q What info do you have on Virgin Islands, transportation and carbon emissions info would be great. (7/27/09)

A Seená, as you probably noticed on our web site, the UN has stopped providing separate energy data for the Virgin Islands but has started including it into the US total. Our CO₂ estimates are based on UN energy data and when they stop providing the data we have no where to go. Gregg

[back from Seená] Thanks so much for the update Gregg. Getting info on this Island has been tough. I appreciate your time.

Q Hello, We are developing a sensor to detect human CO₂ emission within rooms. Where is the best source to describe typical output from a human per hr and how to measure (what ppm) scale would be needed? This is to help input into a remote sensing prototype and I'd be happy to quote CDIAc as the source for this data. (7/27/09)

A Dear Jason Campion, We appreciate your question to the CDIAc Web site. I am forwarding this to Tris West who can answer your question better than anyone else. Sincerely, TJ Blasing

Q Do you still have this graphic on your site (I can't find it)? We're using it on our ClimateChange web site page: <http://www.epa.gov/climatechange/emissions/globalghg.html>, Figure 2: Global CO₂ Emissions from Fossil Fuel Burning, Cement Manufacture, and Gas Flaring 1751-2002. Please take a look at the graphic and e-mail or call, I'm working to update this information. Thank! (7/27/09)

A Carolé, my guess is that your staff produced this graphic from our data. We now have on our web site the full data set out to 2006 (and will soon have 2007 and 2008), but have not prepared a graphic exactly like this. I think we can help (i.e. Tom Boden) if this is a problem for you to update. Also note that we have an updated, sort-of, version of your graph 3. It is only for CO₂, but it shows that the crossing between "developing" and "developed" has already occurred. A copy is attached. Let us know how we can help. Gregg

[Carol writes back] Gregg, Thank you for your quick response and offer to help. We're in the process of doing some simple fixes on the website and more involved changes may have to wait until this Fall. Could you tell me who we should contact/call re data for graphic updates? We really like our little graphic...and your new CO₂ graphic is interesting too. Regards, Carolé

[Tom Boden jumps in] Dear Carolé, I saw your e-mail exchange with Gregg Marland seeking data to update your fossil fuel emissions graphics. The national data needed for your graphic may be found at http://cdiacornl.gov/trends/emis/tre_coun.html. The regional data may be found at http://cdiacornl.gov/trends/emis/tre_regn.html. Please contact me if you need additional data or clarification. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory 865-241-4842

Q Hi, I'm a professional marketer working on a green business plan. My idea is to form a non-profit to promote a return to bowl and brush shaving cream. If all men used a bowl and brush, X tons of steel and aluminum, currently produced for shaving cream cans could be eliminated, reducing CO₂ emissions as well as landfills. So my question is, how can I quantify the positive effects our organization will have. I need compelling figures on CO₂ reduction as a result of 'canning the shaving cream cans'. The data will be used in our fund raising as well as in consumer advertisements for the shave brush products. I hope you can help us. Thank! and feel free to call me to discuss. (7/22/09)

A David: How about reviving the Burma Shave signs we used to see along the road -- or are you too young to remember those? <http://www.fiftieswebcom/burmal.htm> You'd have to figure out how to do it differently because the original signs weren't designed for today's superhighways. Also there might still be a copyright or patent issue. The wit was usually distributed over 5-6 signs about 100-200 feet apart; the last sign always said "Burma Shave." You could work out something like 1 sign each for each line of the ditty below, which is the best I can do off the top of my head. Your shaving habit can go green. Replace your electric Shaving machine with Shave electricity free. OK, getting serious. About 1.5 lbs of CO₂ = 0.7 kg CO₂ = about 0.185 grams of oxidized carbon enters the air for each kW-h of electricity consumed. This is a national average and will vary with location and time of year (for example, CA has access to a lot of hydropower, so they will produce less CO₂ per kW-h than the national average over the course of the year, but in late summer the hydropower starts to run out, causing a tendency to switch to natural gas and increase carbon emission on a seasonal basis.) This is the amount of carbon dioxide saved at the generating station; it does not count the energy from gasoline used to haul the coal to the power plant, or the emitted carbon from producing the energy to put in the gas pipeline to build a dam or a nuclear plant. Of course, it also ignores the carbon from energy and coking coal used to make razor blades and shaving cream. I'd just go with the 1.5 lbs of CO₂ per kW-h; I might be able to dredge up some regional info if you'd like. Offhand, I don't have any idea how many kW-h my (electric, sorry) razor uses each day, but I could figure it out from the

ampereage assume 110 volts, and time myself shaving in the morning TJ Blasing

Q Is there any way to differentiate experimentally between CO₂ in the atmosphere that originated from the burning of fossil fuels versus atmospheric CO₂ from other sources? (7/22/09)

A Hi Stephen Fossil CO₂ (from combustion of fossil fuels and from cement manufacture) has no carbon-14. There are also differences in carbon-13 ratios that can tell us whether the carbon is from natural gas or coal or oil, although coal and oil don't differentiate as well from each other as either of them does from natural gas. When ratios of these isotopes are low, there is a higher percentage of fossil carbon in the air being measured. In one experiment, Diane Pataki was able to identify the annual cycle in natural gas use in the Salt Lake City urban area, just using the carbon-13 ratios. T.J. Blasing

Q Hello, I am a journalist doing research for an article for The Straits Times in Singapore. I want to explain how carbon emissions are calculated internationally. Can you help? Also do you know who takes responsibility for ship emissions? Thanks Victoria (7/21/09)

A Dear Victoria, We appreciate your question to the CDIAC Web site. I encourage you to visit http://cdiac.ornl.gov/trends/emis/overview_2006.html for a discussion of our emissions methodology and pointers to emission time series. In our methodology emissions from bunker fuels (i.e., fuels used for international commerce via aircraft and ships) are attributed to the country where the fuel loading took place. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

[from TJ Blasing] Hi Victoria I'm going to let Gregg Marland answer the harder parts of this question later, but I may be able to get you started on the "ships" part now. If the ship is being used for "international transport activities" (i.e., it leaves one nation and arrives in another), none of the emissions from fuel combustion are charged against either country. Instead these emissions are put in a separate category known as "international bunker fuels" or simply as "bunker fuels" on our spreadsheets and in some other places. For a ship leaving one country and arriving in another part of it, emissions are charged to that country. The carbon emissions for each country are calculated from statistics on energy use. I'll let Gregg take it from here. TJ Blasing

Q Dear Sirs, I would like to know if you include in your figures of World CO₂ emissions from fossil fuels* the CO₂ released in the atmosphere while producing natural gas (to my knowledge, the CO₂ content of Natural Gas reserves varies between 5 and 15%, which makes natural gas production a significant contributor to Global CO₂ emissions). If ever those amounts of CO₂ are not included in your statistics, why is it so? With thanks, Sylvie HAXAIRE IIFP - France* Fossil-Fuel CO₂ Emissions Global, Regional and National Annual Time Series - Latest Published Global Estimates - Preliminary 2006-07 Global & National Estimates by Extrapolation (2008 estimates coming soon) - Top 20 Emitting Nations Based on Latest (2006) Estimates of Total Emissions Per Capita Emissions (7/20/09)

A This factor is difficult to include in detail but in theory we do work from the global average chemistry of natural gas, so it is included in principle. Gregg

Q The government's Carbon Dioxide Information Analysis Center (CDIAC) of the Oak Ridge National Laboratory does not estimate carbon dioxide emissions from soft drinks, pets, fireplaces, campfires, barbecue grills, alcohol production, milk cows, beef cattle, yeast, dry ice, biofuels, and other carbon dioxide emitting sources. CDIAC keeps data ONLY on "estimates" of fossil fuel (oil and coal) emissions. True or False? (7/19/09)

A As usual, somewhere in between. We keep records of CO₂ emission estimates from combustion of coal, oil, natural gas (including gas flaring and gas used in those those funny little fireplaces with fake logs) and cement manufacture. We don't publish estimates from biofuel combustion (barbecue grills, biofuels, campfires and fireplaces using wood ethanol, etc.), although estimates of some of these have been made and I could probably give you some leads on some of these if you need them. Forest fires can also transfer a lot of CO₂ from the biosphere to the atmosphere in a short time. EPA's "Inventory of Greenhouse Gas Emissions in the United States" has a more complete inventory than we have of CO₂ emissions from manufacturing processes. <http://epa.gov/climatechange/emissions/usinventoryreport.html> Hope this helps. TJ

Q Hi, I am a researcher at Stanford University. I am wondering if you have the latest data on CO₂ emission level in CHINA (beyond 2006). Thanks (7/13/09)

A I am working on finishing up the preliminary estimates today. We should have numbers tomorrow. Gregg

Q Good Afternoon Dale, I am trying to locate the rainfall amounts for the month of June and July 2009 for St. Petersburg FL. Would you be able to guide me in the right direction as to where to find this information? I went to the US HCN data, clicked on the Total Precipitation for Florida and I don't understand what I am looking at. Suzanne Noyes Field Office Manager jobsite address Manhattan Construction Co. 450 8th Ave. SE St. Petersburg FL 33701 727-823-3271 phone | 727-823-3496 fax email:

snoye@manhattanconstruction.com Tampa address Suite 112 204 S. Hoover Blvd. Tampa, FL 33609 813-675-1960 phone | 813-675-1968 fax email: snoye@manhattanconstruction.com www.manhattanconstruction.com (7/9/09)

A Hi Suzanne Our generally annually updated version of the HCN would not have data for the current year. For more real time data like that you can get a wealth of info. from Nat. Weather Svc. web pages. Please go here: <http://www.weather.gov/climate/index.php?wfo=tbw> If you click on Preliminary Monthly Climate Data (CF6) you can select St. Pete. and choose the most recent (current) month or past months (archived data). For cities of any size this type of data is usually available from the local NWS pages. Hope this helps If you need to use HCN in the future and have questions I should be able to help with that too. Regards Dale Kaiser CDIAC

Q Hi Dale, Thanks for this information - very interesting. These reports appear to suggest that the biosphere does not remove all the fossil fuel emissions, even if the total emissions are reduced. In other words, even if we reduce CO₂ emissions by 72% (as in my calculation below) there would still be a build-up of CO₂ beyond the current level. So if we cut our CO₂ emissions to 8 billion tons per year, from the current 29 billion tons, that would still add about .55 x 8 = 4.4 billion tons of CO₂ to the atmosphere. Wouldn't it be possible to remove this additional amount by planting more trees? Why would the percentage stay constant? I'm sure there is a lot of uncertainty in all this, but I appreciate the work you do to publicize the most scientific findings. Thanks again, Jack (7/9/09)

A Hi Jack, This is a very interesting and critical subject I am not expert in it, as I am more of a general climatologist rather than a carbon cycle modeler. However, as you note, things are very complex and uncertain, so I found a paper that should supplement what the IPCC Reports said. I've attached it, and I found the following passage helpful for starters. P. 2869: "The CO₂ airborne fraction (the fraction of total emissions from fossil fuels and land use change accumulating in the atmosphere) has averaged 0.43 since 1959, but has increased through that period at about 0.24% y⁻¹ (Canadell et al., 2007). These interdecadal trends in CO₂ growth rate and the airborne fraction are the outcome of a race between two groups of forcing factors: the social, economic and technical drivers of anthropogenic emissions (including population, wealth and the carbon intensity of the economy), and the biophysical drivers of trends in land and ocean sinks." What I get from this is the AF is not staying constant, has been rising some and will continue to do so, but given the numerous feedbacks in the earth-ocean-atmos system, the nature of future changes can only be modeled with some uncertainty. That it's not been rising faster is surprising at first blush, but again, it's those darned feedbacks (discussed in the paper and I would assume some in IPCC). Oh, and with regard to trees, yes, any additional carbon sink would help, but various studies have shown the the required scale of tree planting is dwarfed by ever-increasing emissions. This is not to say that we still shouldn't increase that type of sink, for many, many reasons. If you want to explore further and talk to a "real" expert, let me know and I can hook you up. Regards, Dale

Q Good morning I am working on the emissions from biomass and I was wondering if you had some data at a global level (world) on emissions issued from the combustion of biomass, production of ethanol compared to the emissions from fossil fuel, for the year 2005 or 2006. Thank you for helping me. Sincerely Olivia (7/8/09)

A Sorry, we do not have such data. The best bet may be your neighbors at the International Energy Agency in Paris. Gregg

Q > Hi Dale, >>>> Thanks for your response >>>> However, my question did not concern respiration. It is about the > ability of the earth to absorb the CO₂ from fossil fuels, land use, and > cement that you discuss on your website. According to your site in 2006 > there were 8.2 billion tons of carbon released to the atmosphere from > these sources (approx 29 B tons of CO₂). >>>> My question is "how much of that can the earth absorb through its > natural processes, and how much of that is building up in the > atmosphere?" >>>> I believe, but I'm not at all sure, that the answer is that about 8 > billion tons of CO₂ can be absorbed, which indicates that we need to cut > 21/29 = 72% of CO₂ emissions to stop the increase in CO₂ buildup >>>> Thanks for your help >>>> Jack (7/8/09)

A Hi Jack, Sorry I missed what you were really asking. The answer is that about 45% of fossil fuel emissions are thought to be absorbed by the biosphere and oceans, making the "airborne fraction" (AF) about 55%. The nitty gritty on this has been covered in the last IPCC Report and you can find it mainly on P. 517 of the Chapter 7 pdf file at this link: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> Regards, Dale Kaiser CDIAC

Q To Whom Concerned Hi, my name is Chris Atkinson and I'm a graduate student at the University of Kansas. I have a data availability question regarding the United States Historical Climatology Data Set. I'm wondering if snowfall maximum and minimum temperatures for Jan. 1, 2006 thru May 31, 2008 are available? If so, where and how would one go about obtaining these materials? Thanks for any advice provided. Sincerely, Christopher Atkinson University of Kansas Geography Graduate Student (7/8/09)

A Christopher, A coincidence that you asked at this time. I just put daily data through 2008 in our ftp area: http://cdiac.ornl.gov/ftp/ushcn_daily/ but we have not released our new graphical user interface yet (but expect to hopefully this month). The files are formatted a little differently and the data flags are different too, compared to our current site through 2005: <http://cdiac.ornl.gov/epubs/ndp/ushcn/usa.html> which does have a GUI. Holler w/ any questions and I'll try and help. At this point you may be interested in knowing that the updated data were extracted from NCDC's GHCN database <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/>. When our GUI is put up we'll have all the needed documentation on our own CDIAC

site too. Regards, Dale Kaiser CDIAC

Q How much carbon dioxide in the atmosphere is due to emissions from the largest volcanoes on the earth? (7/6/09)

A Dear Paul Franks We appreciate your question to the CDIAC Web site. Volcanoes have a very small effect on atmospheric CO₂ concentrations. The average annual emission is estimated at just over 100 M Tonnes of CO₂. By contrast, annual fossil fuel combustion emissions are over 8200 M Tonnes globally. These links will show you more <http://volcanoes.usgs.gov/hazards/gas/index.php> <http://volcanology.geol.ucsb.edu/gas.htm> http://cdiac.ornl.gov/trends/emis/meth_reg.html Sincerely, Dale Kaiser CDIAC

[from Bob Andres] Paul, I do not have an exact answer for you, but you can get a sense of relative contributions from the CO₂ emissions to the atmosphere. A recent study by Morner and Etiope (2002, Global and Planetary Change, pp. 185-203) estimated volcanic fluxes to the atmosphere as 300 million metric tonnes C per year. Our recent fossil-fuel-consumption global CO₂ emissions estimate is 8230 million metric tonnes C per year (in year 2006). So, the volcanic flux is approximately 3.6% of the fossil fuel flux. I hope this answer was helpful. Sincerely, Robert Andres

Q From reading your site's section on the carbon cycle, I understand that the earth's land and water can absorb about 2.3 billion tons of CO₂ per year. If there are 6 billion people on earth that would suggest that we can only emit about 0.4 tons per person per year that can be absorbed. But I have also read that the world average emission is over 5 tons per person and is about 25 tons/person in the U.S. Does this mean that the world has to reduce CO₂ emissions by over 90% and the U.S. by 98% to stop the CO₂ buildup? (7/5/09)

A Dear Jack Lucero Fleck We appreciate your question to the CDIAC Web site. For an explanation please see the email thread I've included below, where I address this issue with someone else w/a very similar question. Regards, Dale Kaiser CDIAC
----- Here is the point though, from the A to the FAQ ... this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus there is a closed loop, with no net addition to the atmosphere. Even if this were not the case, (but it IS the case), some scale analysis can be done. Fossil fuel emissions, global, per year, 2005 = about 8 X 10⁹ metric tonnes or about 8 trillion kg of carbon PER YEAR. Then, take for example a population increase (over some number of decades) of 1 billion folks times 1 kg CO₂ (or about .3 kg C) times 365 days/year, or about 110 billion kg of C per year. A factor of about 75. On Saturday 11 April 2009 04:02 pm, you wrote > Thank you, (referring to question #13) but ~ 1 kg of exhaled carbon > dioxide per day per person times ~ 7 billion people is a lot of > carbon dioxide! What I had asked, perhaps not too clearly, is what > part of the recent increase in atmospheric carbon dioxide can be > attributed to the increase in the world population for the past > decade (or for the past period during which atmospheric carbon > dioxide and world population increase has been measured) ... or can > such a correlation even be teased out of the data! >> Richard D. Stacy > ----- > ----- >> On Apr 8, 2009, at 8:29 AM, kaiserdp@ornl.gov wrote >> Dear Richard D. Stacy, >>> We appreciate your question to the CDIAC Web site. >>> Please see question no. 13 on our FAQ page for the correct way to >> think about this issue >>> <http://cdiac.ornl.gov/faq.html> >>> Sincerely, >>> Dale Kaiser >>> CDIAC Sincerely,

Q I'm writing a book for a non-profit and I can't seem to find a basic piece of data that I need: Question: What do scientists estimate to be the sustainable limit of anthropogenic CO₂ emissions (i.e., billions of tons CO₂ per year)? I understand that there are differences of opinion about what the 'sustainable limit' might be, but whatever IPCC or 350 ppm or ?? would be very helpful. Thanks! (7/3/09)

A There is no simple answer to this simple question. It might depend on how one defines "sustainable". Rich folks can cash their dividend checks in Alaska just as well as they can in LA, but it's different if you have to work for a living, so the definition is socially variable. It also depends on how much emitted CO₂ stays in the atmosphere; the oceans and biosphere can take up some CO₂, and geo-engineering can facilitate the take-up of more; any amount of CO₂ emissions is sustainable as long as you can take it all back out. Of course we haven't figured out how to do that economically and safely, but people are working on it. Other ways of geo-engineering could also affect sustainability: reflective devices in orbit could reduce incoming solar radiation, so that climate would stay cooler. If we could do that safely (key word) it wouldn't matter much if atmospheric CO₂ (combined with other greenhouse gases) effectively doubled or tripled the current radiative effects of CO₂ in the atmosphere. Fossil-fuel reserves could also define "sustainable". If a source runs out, one can't sustain any more emissions. So, I'm sorry I can't give you a simple answer, but that's the way life is. You may want to re-phrase your question in the book you are writing. TJ Blasing

Q Dear Sir/ Mada, I am working on the detection of suitable soils for Zero-Tillage (No-Tillage) Wheat sowing in Rice wheat areas using GIS and Remote Sensing. I want to incorporate the Values of CO₂ emission through Zero-Tillage and conventional tillage. For quantifying the reduction in CO₂ emission using Zero-Tillage. Can you help me in this regard? Best regards (7/3/09)

A Dear Faheem, You will need to locate some field experiments that have measured changes in soil carbon following a conversion of conventional tillage to zero-tillage when planting wheat in an area where climate and soils are similar to your area of study. If you are moving from rice to wheat that will act as a confounding variable in your analysis. If wheat produces more residue than rice, you may see an increase in soil carbon in addition to the change to zero-tillage. Please remember that a reduction in CO₂

emissions from the soil does not equate to an increase in soil carbon, or vice versa. Best of luck in your work. Sincerely, Tris West

Q | CDIAC team, Can any of you help National Geographic plug data for this chart, or refer them? The best thing to do might be just to have them send one of you a draft. Thanks! Mike Bradley ORNL Communication (865)576-9553 bradleymk@ornl.gov (7/2/09)

A | Mike We have data back to 1000 at the following link: <http://cdiac.ornl.gov/trends/CO2/lawdomegraphics.html> For data before that, you might want to contact Eric Monnin (University of Bern, Switzerland) at: monnin@climate.unibe.ch He would probably have the required data, or know of a colleague at the same university who has it. TJ Blasing

Q | Dear Sir or Madam, I wish to use data from doi 10.3334/CDIAC/00001 (National CO₂ Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring 1751-2006) in a manuscript. Please, could you advise me as to the appropriate way of citing this data? Many thanks! (6/30/09)

A | Dear Antje Ahrends, I can see the source of your confusion in one place, Marland's name is first and in the suggested citation at the bottom of the page: http://cdiac.ornl.gov/trends/emis/overview_2006.html Boden's name is first. I would stick with the suggested citation CITE AS: Boden, T.A., G. Marland, and R.J. Andres. 2009. Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001 Sincerely, TJ Blasing

Q | please, is the high temperature of gases like CO₂, NO₂ & SO₂ decrease their ability to be solved in water? regards FARID (6/30/09)

A | The solubility of gases in water decreases with higher temperature. The reason for this is that as temperature increases, molecules move faster and become easier to break away from intermolecular bonds and escape from water. Lianhong Gu, R & D Staff Scientist, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831. Tel.: 1-865-241-5925 lianhonggu@ornl.gov

Q | > I have two questions > > 1) The Keeling Curve for Mauna Loa atmospheric CO₂ shows a 20% > increase over 50 years. Isn't this about the same increase as aircraft > landings and taking-offs at Honolulu Airport over the same period, and > instead of the annual variation being explained by N Hemisphere > spring/growth vs autumn/decay, it is just the seasonal wind direction > changes between Mauna Loa and Honolulu Airport > > 2) There seems to be no data on atmospheric CO₂ vs altitude > to > 30,000ft (upper troposphere), where any "greenhouse" will be, if it exists > at all. > Stan Yeaman (6/29/09)

A | Please see below... On Sunday 28 June 2009 08:27 pm, you wrote > I have two questions > > 1) The Keeling Curve for Mauna Loa atmospheric CO₂ shows a 20% > increase over 50 years. Isn't this about the same increase as aircraft > landings and taking-offs at Honolulu Airport over the same period, and > instead of the annual variation being explained by N Hemisphere > spring/growth vs autumn/decay, it is just the seasonal wind direction > changes between Mauna Loa and Honolulu Airport. Interesting theory. I also find interesting the correlation between US stock market performance and the winner of the Super Bowl each year. Seriously, CO₂ concentration has been measured over the years at dozens and dozens of places around the world, and significant increases are observed everywhere due to the well-mixed nature of CO₂ in the atmosphere e.g., <http://cdiac.ornl.gov/trends/CO2/> > > 2) There seems to be no data on atmospheric CO₂ vs altitude > to > 30,000ft (upper troposphere), where any "greenhouse" will be, if it exists > at all. CO₂ is very well-mixed both vertically and horizontally in the atmosphere. See, for example <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> <http://www.nature.com/nature/journal/v316/n6030/abs/316708a0.html> Dale Kaiser CDIAC > > > Stan Yeaman

Q | > Hi, could you please tell me how I can get the mean temp or precip graphs > for the entire state of Pa., not for specific stations > I would assume that > is averages of all the stations > Also, how about the same thing for the > entire continental US? (6/29/09)

A | Hi, please see below... On Sunday 28 June 2009 06:51 am, you wrote > Hi, could you please tell me how I can get the mean temp or precip graphs > for the entire state of Pa., not for specific stations > I would assume that > is averages of all the stations. We don't have pre-averaged state data or plots, because if one wanted to get an area average this is really a science question related to the spatial distribution of the stations > and just how you'd do it mathematically. A simple adding things up and dividing by the no. of stations would not be a good way. For something useful, please visit the NCDC website, specifically this page: <http://www.ncdc.noaa.gov/climate-monitoring/index.php> You could drill down through "Statewide Temp Ranks". Another site you may be interested in is: <http://www.ncdc.noaa.gov/oa/climate/research/ghcn/ghcngrid.html> which shows gridded temp trends over grid boxes > Also, how about the same thing for the > entire continental US? You can see time series and such at the same NCDC page as above: <http://www.ncdc.noaa.gov/oa/climate/research/2008/cmb-prod-us-2008.html> You can click on: U.S. National Temperature Time Series. Regards, Dale Kaiser CDIAC

Q I know you from your website http://daac.ornl.gov/FIFE/guides/Historic_Monthly_Met_Data.html#16. Could you please tell me whether I can find the following meteorological data: Station: New York City, USA Month: October Year: 1918 Parameters: 1. temperature 2. humidity 3. precipitation 4. amount of cloud/sunny hours per day. Your kind help will be appreciated. Looking forward to hearing from you. Best regards, Steven (6/28/09)

A Steven, My colleagues at the ORNL DAAC have asked me to assist you with your question. For temp and precip, I think you'll find what you need through CDIAC's USHCN Daily data interface; the main address is: <http://cdiac.ornl.gov/epubs/ndp/ushcn/daily.html>. If you follow the links looking for NY data, you'll eventually get to the Central Park data at this link: http://cdiac.ornl.gov/cgi-bin/broker?_PROGRAM=prog.climsites&_SERVICE=default&id=305801 where you can download data, make plots, etc. Regarding sun, and cloud... I can point you to *monthly* cld and sun. This is from CDIAC's NDP021: <http://cdiac.ornl.gov/ndps/ndp021.html> (Data avail. through the link on top of page.) In file list, read the .txt file to learn about contents/format of these data files which have the cloud and sun data: ndp021r1.f10 ndp021r1.f11 ndp021r1.f12 ndp021r1.f13. This database was put together in maybe 1991, so it's not as easy to navigate as it should be, but the data are there. With regard to RH data I'm not sure if they are available, but you could visit the NCDC website - www.ncdc.noaa.gov and try various database searches. Regards, Dale Kaiser CDIAC

Q In your site, I am trying to look for atmospheric ^{13}C data over a period of time, say year 1990 to 2009 at Antarctica please help (6/26/09)

A Dear Sanjeeva Nayaka, I have some ^{13}C data for the South Pole from 1977-2007. It comes from Ralph Keeling at Scripps Institution of Oceanography. We would appreciate it if you would cite it as such in any publications arising from your work. I will be sending the data in a separate e-mail, along with the proper citation. Sincerely, TJ Blasing

Q Hello. Can you tell me where I can find more recent CO_2 ppm data from any monitored locations? They all seem to end in 2007. I have installed a CO_2 monitor outside my home in the Sacramento, CA area. I would like to extrapolate back cast from my data to approximate a longer term record. I am recording data hourly. Are there any other official public sites, especially inland sites that are recording hourly? Best regards, Greg Brehm (6/26/09)

A Greg, Most of the sites monitoring global CO_2 are in remote locations, so the air being monitored has been well mixed into the atmosphere and is representative of global conditions. Sacramento is representative of Sacramento, which might be interesting in itself. I am attaching some studies by Diane Pataki that deal with seasonal CO_2 variations in urban areas; Diane also has hourly data for Salt Lake City. Basically, though, I can't help you much for Sacramento, CA; I wouldn't want to extrapolate/interpolate someone else's measurements to my own backyard. Nonetheless, you may find something interesting from your monitoring, maybe even something publishable. We certainly encourage "citizen science" and wish you the best. You might want to find a local meteorologist who can give you some hints about citing a monitor to avoid unwanted CO_2 sources, such as your car's tailpipe. Sorry if I sounded a bit facetious there, but professionals have made similar mistakes over the years, providing a wealth of material for bar talk. Again, we wish you good luck, and applaud your effort. TJ Blasing

Q Dear sir, I am curious to know about the measurement of the Global CO_2 concentration. I want to know why have we shifted measuring the CO_2 concentrations from ice core data to Mauna Loa measurement. Since Mauna Loa research station is located near a volcano, I want to know the scientific reason behind it. I also wanted to know, why is there a gap of 4 years (1954- 1958) in between the measurements of ice core data and Mauna Loa data. Kindly clarify at your earliest convenience. Thanks & Regards, P. Sateesh Kumar, Engineering Consultant, L&T Ramboll Consulting Engineers Limited, Sudhir Tapani Towers, 3-6-271 - First floor, Himayath Nagar, Hyderabad- 500029 India. Office: 040-40354440, Fax: 040-40354430, Mob: +91-9177430777 (6/25/09)

A Dear Sateesh, Thanks for your inquiry. Please see my insertions below. On Thursday 25 June 2009 06:33 am, you wrote > Dear sir, >> I am curious to know about the measurement of the Global CO_2 concentration > I want to know why have we shifted measuring the CO_2 concentrations from > ice core data to Mauna Loa measurement. It's not so much that scientists have "shifted" from ice to air, it's just that the Siple core: <http://cdiac.ornl.gov/trends/CO2/siple.html> was drilled in 1983-1984, and the air measurements (the most accurate and direct measurements) started at Mauna Loa in 1958. The ice core data simply give us pre-1958 data so we can have a long-term record. > Since Mauna Loa research station is > located near a volcano, I want to know the scientific reason behind it. from the Mauna Loa page on our site <http://cdiac.ornl.gov/trends/CO2/sio-mlo.html> "The Mauna Loa site is considered one of the most favorable locations for measuring undisturbed air because possible local influences of vegetation or human activities on atmospheric CO_2 concentrations are minimal and any influences from volcanic vents may be excluded from the records." That is, due to the continuous sampling they can detect and adjust for artificial volcanic effects. Also, see the main Scripps page: <http://scrippscc2.ucsd.edu/home/index.php> > I > also wanted to know, why is there a gap of 4 years (1954- 1958) in between > the measurements of ice core data and Mauna Loa data. The record from the Siple core does not have annual resolution, only measurements for every 1 to 2 decades. Regards, Dale Kaiser CDIAC

Q You didn't answer my question from last month concerning how CO_2 is able to trap enough heat in the earth's atmosphere to cause any significant temperature rise given that it only represents .04% of the earth's atmosphere. Here is a follow-on question that I have yet to see addressed in any scientific studies or discussions, and I would appreciate your insight. If the dynamics of CO_2 are such that a concentration of only .04% of the earth's atmosphere is sufficient to cause a significant increase in temperature, then why do we not see warm temperatures on the planet Mars, which has an atmosphere comprised of over 95% CO_2 (a concentration

that is over 2300 times greater than that in the earth's atmosphere? What is different about the warming dynamics of CO₂ on the two planets? Thank you... Chalker W. Brown Director, LSI (904) 779-6081 (6/25/09)

A Chalker, I'll chime in with the following... A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic i.e., additional CO₂ will have a gradually smaller effect than the CO₂ already in the atmosphere, the picture is also much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> ... radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. If we transplanted all of earth's activities to Mars, we could run the same experiment that we're running now on earth, so in that way it's not completely different. All told, the Martian atmosphere is a lot thinner than earth's, plus of course it's a lot farther away from the sun. Venus is a much better example of runaway "greenhouse" warming. What we're studying here are forcings (changes applied) to the system that change radiative balance in complex ways discussed in the sources above. Dale Kaiser CDIAC

Q Please could you define the difference in layman terms of carbon and carbon dioxide (6/23/09)

A Carbon is an element with 6 neutrons in the nucleus. Carbon dioxide is a molecule where one carbon atom is combined with two oxygen atoms. Most of the carbon in the Earth's atmosphere exists as carbon dioxide. If you want to know how much carbon is in the atmosphere you can estimate the mass of carbon directly or you can estimate the mass of carbon dioxide and divide by 3.67. A molecule of carbon dioxide weighs 3.67 times as much as does the carbon in it. Gregg

Q Hello- I have been working to find a source of historical emissions in terms of CO₂ e. Your data using CO₂ e is very useful and I am wondering if you might have, or know who has, historical emissions using CO₂ e? Thanks very much, Jon (6/23/09)

A The answer depends on how you define CO₂e. I guess that to answer your question I would really need to know how you define CO₂e (which gases and sources do you want to count) EPA is probably the best source for historical greenhouse gas emissions from the United States, but their history only goes back to 1990. The link is: <http://epa.gov/climatechange/emissions/usinventoryreport.html> All for now, TJ Blasing

[from Jon] Thanks much for the reply. Recognizing that it is quite broad- I am interested in CO₂e as it pertains to converting all GHGs from all sources worldwide into CO₂ equivalents (I am doing some analysis related to Copenhagen proposal). The EPA page is useful, thank you. As it is focused on the U.S. I will keep trying to find this data worldwide- any thoughts or suggestions are most welcome. Thank you again, Jon

[Jon replies...] Thanks much for the reply. Recognizing that it is quite broad- I am interested in CO₂e as it pertains to converting all GHGs from all sources worldwide into CO₂ equivalents (I am doing some analysis related to Copenhagen proposal). The EPA page is useful, thank you. As it is focused on the U.S. I will keep trying to find this data worldwide- any thoughts or suggestions are most welcome. Thank you again, Jon

[Gregg writes back...] Jonathon, have you found the World Resources Institute CAIT data? Also, the web site of the United Nations Framework Convention on Climate Change maintains a nice summary of emissions data, but it is taken from the national reports and thus is only for Annex I countries. Both of these data sets should be easily found using Google, but let me know if you have difficulties. Gregg

Q I am trying to analyze the carbon cycle with regard to gross C_{et} versus NET C_{et}. 3/4 of CO₂ NET comes from fossil fuels. Numbers I have are: C_{et} to atmosphere 6.4 C_{et} NET added to atmosphere 3.2 billion C_{et}. 2.4 billion C_{et} from fossil fuels. 40% electrical generation, 20% transportation, industrial 18%, other 8%, residential/commercial 13%. Can you help here? (6/22/09)

A Norman, you are going to have to help me with the vocabulary here. What do you mean by gross and net and what are C_{et}? This is unfamiliar phrasing. Gregg

Q I'm interesting in acquiring information about the estimated CO₂ e parts per million over the last 100 years. Do you have a chart or report with figures that might approximate what I am looking for? (6/22/09)

A Dear Jesse Swanhuysen, The World Resources Institute CAIT data might be helpful. Also, the web site of the United Nations Framework Convention on Climate Change maintains a nice summary of emissions data, but it is taken from the national reports and thus is only for Annex I countries. Both of these data sets should be easily found using Google, but let me know if you have difficulties. Sincerely, TJ Blasing

Q Hi, First let me say I found your website very informative and a great resource for understanding CO₂ and its impact on climate change. I have a question you might like to help answer as I am having trouble finding a clear answer on the internet. Is

there any truth to the comments that atmospheric CO₂'s infrared absorption capacity (within its absorption bandwidth) is effectively reached at somewhere near 30 ppm (even though it is now near 400 ppm)? Also as an extension is there a logarithmic effect to absorption and its consequential effects? What are the implications of this type of scaling? Some arguing that CO₂'s effect on warming is effectively 99% already within its bandwidth range. I am not a skeptic but (okay that sounds a bit like a skeptic..). I do have questions still and I am intent on doing my own research on these matters. Any clarification would be greatly appreciated. Regards, Ben Sann Melbourne, Australia (6/17/09)

A Hi Ben, Thanks for writing to CDIAC and for your kind comments on our site. Your question is an excellent one and we're seeing variations of it a lot lately. A truly satisfactory explanation of CO₂ warming is not very easy to find in the media or even in the scientific literature (I'm not a modeler nor do I consider myself a "true" expert on atmospheric radiation). While it's true that the relationship between CO₂ concentration and warming (or "radiative forcing" due to CO₂) is logarithmic, the picture is much more complicated than that. Here are a few sources which discuss things in enough detail to sort things out: The realclimate.org website specifically <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument/> And of course, there are the latest IPCC reports <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> ... radiation mainly dealt with in Chapter 2. Page 140 hits the mark where you want it to. Happy reading. Regards, Dale Kaiser CDIAC

Q I understand that CO₂ spreads evenly throughout the planet's atmosphere and now constitutes about 380 parts per million. I also understand that the primary greenhouse gas, water vapor, does not spread evenly in the atmosphere and consequently that the computer models cannot quantify the amounts of and/or the effects of water vapor and clouds in their programs. If this is so, how can a computer model logically conclude that the recent rise of the average earth temperature is due to anthropogenic CO₂ rather than to changes in water vapor, clouds, or other factors such as sun spots? (6/17/09)

A Dear Don W. Crockett, We appreciate your question to the CDIAC Web site. You're correct in that water vapor is the principal GHG in the atmosphere. Certainly it is not distributed evenly in the atmosphere either vertically or horizontally (as one can attest to living in Oak Ridge, TN or Washington, DC in the summer and taking a weekend trip to Aspen or Death Valley). Actually, numerical weather prediction models (used to help make day to day forecasts) and climate models do a very good job of determining the dynamics of water vapor spatially. Indeed, the parameterization of clouds has historically been a bit tougher for the models, but great strides have been made in the last 10-15 years thanks to improved observations to help understand cloud macro and microphysics (e.g., see DOE's own Atmospheric Radiation Measurement Program arm.gov) and more powerful computers. Regarding confidence in the models implying that much of the recent warming is due to the radiative forcing of CO₂, the best sources that I always direct people to are the reports of the Intergovernmental Panel on Climate Change (IPCC). This is a complex research problem to be sure. Thus, it's not possible in this email to lead you through all the reasoning. All of the things you note (including analysis of solar variations effects on climate) are dealt with thoroughly in the IPCC reports. Conclusions are based on 1000s of peer-reviewed papers in the literature. There are basically four levels of detail in the reports. At the link below, you may want to take things in this order: Summary for Policymakers, Frequently Asked Questions, Technical Summary. Then, much more detail is contained in individual chapters <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> I can also recommend a recent high-level report from the National Academies of Sciences <http://americasclimatechoice.org/basics.shtml> I hope this helps. Agreed, a big complex issue. Regards, Dale Kaiser CDIAC Sincerely,

Q How/where do you get CO₂ emission information from Thailand? Do you have this info by sector? (6/17/09)

A Dear trin intaraprasong, We appreciate your question to the CDIAC Web site. While our true resident expert is on travel, I can tell you the basic answer to your question as explained in the main CO₂ emissions page on our site http://cdiac.ornl.gov/trends/emis/overview_2006.html "The 1950 to present CO₂ emission estimates are derived primarily from energy statistics published by the United Nations (2008)..." (United Nations 2008, 2006 Energy Statistics Yearbook United Nations Department for Economic and Social Information and Policy Analysis, Statistics Division, New York.) Regards, Dale Kaiser CDIAC

Q Sir, I want to know that how the concentration of CH₄ and N₂O is being determined in the samples using gas chromatography technique. Particularly, I am interested in knowing the equation by which one can calculate the concentration of these gases in any sample. What was the retention time and peak area and how are these helpful in calculating the CH₄ and N₂O concentration. Wishing an early positive response. Thanking you sir. (6/16/09)

A Dear A K Mishra, Well, sorry this wasn't earlier. The AGAGE site provides some material on gas chromatography including some references <http://agage.eas.gatech.edu/> If you can't find what you're looking for there, the principal investigators could probably point you to the published material which best answers your question. Sincerely, TJ Blasing

Q What does the "vulnerability of coastal areas to rising sea level" have to do with CO₂? Isn't it a stretch to believe that CO₂ will control the rise in surface temps enough to increase ocean volume that much? I would like to know where to find these calculations and/or data? (6/16/09)

A Dear Jim Siverly, Rising CO₂, in the absence of counter-effective phenomena, increases atmospheric temperature. Additional heat can partially (or completely in an extreme case) melt ice caps over Greenland and Antarctica, the water then flows into the oceans. Additional heat also causes volumetric expansion of the ocean. We appreciate your question to the CDIAC Web site.

Sincerely, TJ Blasing

Q In a first stage, this study aims to analyze the climate evolution at the Vila Real administrative district during the last decades. The historical information will be observed in order to detect the past tendencies of evolution. Past will help us to predict future. In a next stage these tendencies will be used to infer the impact of these changes scenarios on the net primary production (NPP) of the forest ecosystems from this study area. I need material for my Tese in Climate Changes (Dioxide Carbon) in Portugal (Vila Real). The concentration of CO₂ is reflexe about the temperature of the land? Please can explain me, how evolution the concentration of CO₂ of the time? Thankyou, for your attention Mónica Rodrigues (6/13/09)

A Dear Mónica Alexandra Rodrigues Your topic is quite complicated so I am not sure I understand the details of your question. The following generalizations may help. Global CO₂ influences global climate, with some time lag; the relationship between global climate and Portugal's climate is more complex. Human influences have increased the amount of CO₂ in the atmosphere by about 35% of its original value over the last 100 years or so. About half the anthropogenic CO₂ is removed by the oceans and terrestrial biosphere, and the other half accumulates in the atmosphere. In other words, the principal removal mechanisms (oceans and terrestrial biosphere) can only remove half of the additional load imposed by human industry. Sometimes a drought over a large area can reduce photosynthesis (less carbon accumulation by the biosphere) and encourage large fires (which put biospheric carbon back into the atmosphere) so that the net effect is to increase the amount of atmospheric carbon dioxide by more than the amount due to fossil fuel combustion. In other cases the oceans and terrestrial biosphere may take up more than half of the additional carbon due to human activities, so that the net increase in atmospheric CO₂ concentrations is relatively small. There are many other influences on the accumulation of CO₂ in the atmosphere which are discussed in the recent report of the Intergovernmental Panel on Climate Change (IPCC) which can be found at: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> Which is in English. You want Chapter 7: Couplings Between Changes in the Climate System and Biogeochemistry. Sincerely, TJ Blasing

Q > Dear Sir/Madam >> I am writing to ask you about Daily Data > I have chosen site 176937, Presque Isle, Maine and i got Daily data from > following website >> http://cdiac.ornl.gov/cgi-bin/broker?_PROGRAM=prog.climsitesas&_SERVICE=de>fault&id=176937 >> After checking Precipitation and Snow data, i found something i couldn't > understand because sometimes Snow data are bigger than Precipitation data > It is impossible isn't it? Maybe I've made misunderstanding about that. > Would you please tell me how can i read Prcp and Snow data? >> Thanks >> Best Wishes, > Jongsuk Kim (6/12/09)

A Question actually answered on 8/28/08 ----- Hi, thanks for your use of the data and for your question. What I can tell you is simply from the data documentation that precipitation values in the USHCN are supposed to be reported in hundredths of inches, snowfall amount is to be reported in tenths of inches, and snow depth is to be reported in whole inches. Some example values to illustrate: Precip = "123" (this is 1.23 inches) Snowfall = "125" (this is 12.5 inches of snowfall) Snow depth = "15" (this is 15 inches of snow on the ground). There are occurrences in the database where things may not look correct (and may have associated "bad data" flags associated with them), and rare occurrences of data that look bad (and may be "bad"), yet are not flagged as having a problem. If these examples and the documentation still leave you with questions, please send specific info. about what you are trying to interpret (actual data records or values with dates). Regards, Dale Kaiser CDIAAC

Q Your comments please on the approximations derived from your graphs contained in "World Climate Report" website dated April 30th 2009 pages 3 and 4 which states that 1.76x10¹² metric tonnes of CO₂ are required to raise the global temperature by 1 degree C. (6/11/09)

A Dear McEntee, We appreciate your question to the CDIAAC Web site. By coincidence I had already read the issue of World Climate Report that you refer to. Personally I see no glaring problem with their "back of the envelope calculation" in calculating the mass of CO₂ emissions that would result (ON ITS OWN, WITH NO OTHER FACTORS BEING TAKEN INTO ACCOUNT) in a global mean warming of 1 degree C. As a "ballpark" estimate it makes some sense. But, this calculation on its own is almost completely worthless (again, just my scientific opinion). The myriad factors at work in the climate system make things much more complicated, much more so than I can address in this email. This is BIG science. Your email did not state your field of expertise or interest, but if you are not familiar with the 4th Assessment Report of the IPCC, this would be a good start. Here are a few links to specific sections: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_TS.pdf http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_FAQs.pdf Sincerely, Dale Kaiser CDIAAC

Q Hello, I am writing a novel and in the story there is a device based on the concept of releasing hydrogen from water using aluminum nanoclusters. This process is being studied for potential applications. If the technology became available it would eliminate the need for burning all fossil fuels. What % of the total anthropomorphic pollution might this eliminate on a global, annual scale? (6/10/09)

A Jefferson, I am sure you realize that this is a question with a lot of ifs, buts, and howevers attached. As a scientist I am frightened by a question with so little constraint. I trust that you have found our data tables in which we provide estimates of CO₂ emissions from fossil fuel use. You are no doubt equally aware that our tables do not address the whole host of traditional pollutants to our air, land, and water. I wish you luck in developing this idea in a coherent and transparent way. Gregg

Q Regarding emissions of CO₂ in Asia (for 2000): What is the assumption regarding the share of biomass fuels (wood) that are harvested in a non-renewable fashion in Asia? Are estimates available for Asia/sub-regions in Asia? Thank you on beforehand
Kristin Aunan (6/9/09)

A Dear Kristin, We appreciate your question to the CDIAC Web site. We do not include emissions from fuel woods in our national or regional emission estimates. SKEE Houghton's emission estimates from land-use changes (i.e., forest clearings) do include releases from slash/burning but also take into account the different wood uses (e.g., longer term carbon storage for wood products

[furniture], etc.) Houghton's national/regional estimates and the documentation may be found at <http://cdiac.ornl.gov/trends/landuse/houghton/houghton.html>. Thanks, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[From Gregg] Kristin, our estimates of CO₂ emissions are for combustion of fossil fuels only. Biomass fuels are not considered in any way. Gregg

Q Your CO₂ data from Mauna Loa and several other stations appeared to show relatively high deviations from the trend in 1969, 1983 and 1998, and relatively low deviations in 1992. Is there an explanation for these? (6/8/09)

A Dear Frederick C. Bell, There is no general explanation that covers all bases. Most of the fluctuations can be explained by the thermal condition of the near-surface ocean, large volcanic eruptions and similar phenomena. Large scale droughts reduce photosynthetic uptake of atmosphere of CO₂ over large areas, and can lead to outbreaks of forest fires which increase carbon input to the atmosphere. Sincerely, TJ Blasing

Q Hello, I'm a data manager at the IFM-GEOMAR in Germany. We are developing a data infrastructure for the marine sciences in Kiel. My colleagues and I are looking for WDC parameter lists to implement already all necessary information to actually guarantee possible data exchange between the infrastructure here in Kiel and the WDCs. I would appreciate an e-mail contact for exchange of your existing parameter lists and the maybe possible automated data exchange procedures. With kind regards Dirk Fleischer (6/8/09)

A Dear Dirk, Thank you for your e-mail to the CDIAC web site. Please contact Alex Kozyr (kozyra@ornl.gov) directly. Alex is our resident oceanographer in charge of CDIAC's oceanographic/marine holdings. I also suggest you contact Margarita Gregg (MargaritaGregg@noaa.gov) at the National Oceanographic Data Center/WDC Oceanography for their parameter lists and protocols. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Yesterday this opinion was published in our local paper: <http://www.westhawaiiitoday.com/articles/2009/06/06/opinion/column/column01.txt>. The bottom line seems to be: more CO₂ in the atmosphere will not effect global warming either way. What's wrong with this argument? I'd like to be able to post a rebuttal. Thanks, Tom Leonard Kailua-Kona, HI (6/7/09)

A Tom, you are a brave citizen. It is a tough job to try to write rebuttal to all of the misinformation that circulates. Occasionally people come up with truly new insights and concerns but this is, as you surely suspect, one that was recognized early and answered many decades ago. Try this web site and see if it works for you. http://www.aip.org/history/climate/simple.htm#L_0141. It turns out that some "saturation" does occur so there is not a linear relationship between CO₂ concentration and heating effect, but as far out as we can imagine, more CO₂ means more radiative forcing of climate. If you want more information you can Google "saturation of CO₂ absorption" and find some other interesting literature. Gregg

Q I am trying to cut and paste digital data from your data bank but I cannot convert it to an excel file to use it for further calculations. How do I do it? (6/5/09)

A Dear Prof R. Krishnamurthy, We appreciate your question to the CDIAC Web site. We do have files in a comma separated value format for easy insertion into spreadsheets (e.g., our national fossil fuel CO₂ emission estimates - http://cdiac.ornl.gov/ftp/ndp030/CSV-FILES/nation1751_2006.csv). Are these the files you are using? Specifically what CDIAC data are you using? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q My company manufactures fibre optic sensing systems for cryogenic leak detection and I am involved in a CO₂ sequestration project where we would install a fibre optic sensing system to detect leakages in the CO₂ transit pipeline to the storage. Could you send me a table or conversion factors showing the relationship between CO₂ pressure and temperature? (6/5/09)

A Sorry, but this is outside of the range of what we do at this data center. Gregg Marland

Q I am looking for global carbon emission data, and the link on your website for "Latest Published Global Estimates" (http://cdiac.ornl.gov/trends/emis/meth_reg.html) seems to be broken. Do you have these numbers published somewhere? Thanks
Emily Fisher (6/4/09)

A Emily: Well, I just clicked on your link below and it worked. I know that yesterday they were updating the site thru 2006, so it might have been offline for awhile. My first recommendation is to try again, and if it doesn't work let me know and I can e-mail you an attached spreadsheet in EXCEL or ANSI or something TJ Blasingblasingt@ornl.gov

[reply from Emily] TJ, Thanks for your quick response I was actually having trouble with this link: http://cdiac.ornl.gov/ftp/ndp030/global.1751_2005.ems which is posted on http://cdiac.ornl.gov/trends/emis/meth_reg.html as "Latest Published Global Estimates". I will check again later, in case this is an updating problem. Best, Emily

[more from TJ] Aha! Not your fault; try this link and see if you can find the difference between it and the one that doesn't work (Hint: there is a clue in my original answer). http://cdiac.ornl.gov/ftp/ndp030/global.1751_2006.ems Meanwhile I'll alert our computer guru to fix the problem. TJ

Q I have a question on Global, Regional, and National Fossil Fuel CO₂ Emissions. CDIAC is now distributing data set (1751-2006). Last year I looked at the same data set but their period was 1751-2004. Today I found the numbers listed in the previous version are slightly different from the current data set. I would like to know a reason why such discrepancy occurs. Thank you for your help in advance (6/3/09)

A Estimates of CO₂ emissions are based on energy data from the United Nations. The energy data include production and trade statistics for all energy sources and all energy commodities. Every year the UN updates their national energy statistics by adding an additional year and including some revisions and updates of data from earlier years. In general there are a significant number of revisions and updates from the most recent years and the number of revisions becomes smaller as you go back further in time in the data set. Our emission estimates are always based on the most recent data from the UN so any revisions of the UN energy data set will result in revisions to the CO₂ emission estimates. Best wishes, Gregg Marland

Q I assume folks are working on possibility of large scale synthetic photosynthesis to help use up excess CO₂. My question: Might it be possible to inject CO₂ in measured quantity into Internal Combustion Engine (with catalyst and perhaps a pre-cylinder of ceramic mat'l) and use up CO₂ in that way. Is the issue high heat to break the double bond? Seems to me if feasible the constituents would then become useful as a fuel source. (6/3/09)

A You are talking about running uphill. The reason that we get CO₂ is that we burn fossil fuels for the energy and the CO₂ is a product. That is, you would have to add energy to break the C-O bonds to get back where you started from. There has been some thought about artificial photosynthesis but nothing useful so far. It is a very complex process - and not actually very efficient energetically. Gregg

Q Hi, According to UNDP's Human Development Report (HDR) 2007/2008, carbon dioxide emissions for Singapore in 2004 amounted to a total of 52.2 Mt. The HDR quotes CDIAC as the source of the figures for all total carbon dioxide emissions. As Singapore is also compiling our own CO₂ emissions inventory, would like to enquire on the source of CO₂ emissions for the CDIAC report given to HDR. pls. Thank you. (6/1/09)

A Emissions of CO₂ are calculated using national energy data as compiled by the United Nations, and national cement statistics as compiled by the US Geological Survey. Gregg

Q Hello! I was wondering if anyone here would know what was the percentage increase in global greenhouse gas emissions between 1989 and 1999. If not, would anyone know where I can find that information? Thanks very much! -Victoria (5/31/09)

A Victoria: Before I could provide a useful answer to your question I need to know if you are looking for anthropogenic emissions, total emissions, or something else? Emissions of different greenhouse gases have increased by different amounts, of course. Below are some starting points for anthropogenic emissions. For anthropogenic carbon dioxide emissions, the information you want can be derived from information on our CDIAC site: http://cdiac.ornl.gov/ftp/ndp030/CSV-FILES/global.1751_2006.csv. For methane, try: <http://cdiac.ornl.gov/trends/meth/ch4.htm>. Nitrous Oxide and ozone are a bit tricky, they are not generally emitted directly (although N₂O can be, but they result from precursor emissions + atmospheric chemistry). For nitrous oxide, you might try: <http://www.stanford.edu/group/EMF/projects/group21/PresentDe2002/Scheehleppt>. The last slide gives you the author's e-mail address. She could probably lead you to the best available data for the time period you specified. http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch02.pdf (page 214) provides a reasonably clear and correct account of the nitrogen chemistry you might need to know if you don't already. Tropospheric ozone is not emitted directly, but is a product of volatile organic compounds and oxides of nitrogen. The following would be a good lead: http://www.sciencedirect.com/science?_ob=ArticleURI&_udi=B6W67-3YYV8M8-5&_user=214864&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C00005635&_version=1&_urlVersion=0&_userid=214864&md5=37de9e88cebee9de81919bf86aa4c0b9. Halocarbons: The AGAGE experiment measures concentrations, and they can provide the best global emission estimates. Try http://agage.eas.gatech.edu/data_afaes.htm. For a start. The "good news" about halocarbons is that they have no natural sources; all emissions are anthropogenic. Finally, if I have provided you with useful information, I could probably dig up some similar kinds of

figures for the fluorinated sulfur species (takes time) and you would have your bases covered pretty well. T.J. Blasing

Q I work for the Wisconsin Department of Transportation and am a Student at Upper Iowa University studying for my degree in Management I am doing my senior Project on producing cement from Carbon Dioxide and have a couple of articles about Calera Corp. but find information limited or information on sequestering CO₂. Would you have anything on Calera's process or any information that I could use for my report. Thank you for your attention Richard Barden (5/30/09)

A Dear Richard Barden, We appreciate your question to the CDIAC Web site. I am going to direct you to Ken Caldeira kcaldeira@dgs.stanford.edu who knows the answer. Sincerely, TJ Blasing

Q Could you please tell me what is the total CO₂ in the atmosphere (weight, e.g. tons), and best estimates for the annual global production of CO₂ by human activity, i.e. burning of fossil fuels and cement production. On the one hand, and the global emission of CO₂ by the oceans and land? Thanks Laurence Mendenhall Adjunct Professor Dept of Earth Sciences and Astronomy Mt San Antonio College Walnut, CA (5/29/09)

A Laurence, if you Google "SOCCR" it will take you to the "first state of the carbon cycle report". I think that all of the numbers you are looking for are in figure 2.1, and the introduction to section 2 updates some of the numbers from figure 2.1. Let me know if this report does not provide all that you are looking for. Gregg

Q I have degrees in oceanography and tropical meteorology and have been in the work force for 34 years. I have been researching through the internet any and all scientific studies that discuss how CO₂ (naturally occurring and man-produced) has any effect on atmospheric temperatures specifically how CO₂ "causes global warming". This seems to be the premise of almost all reports that subscribe to man-made global warming and climate change. I recently reviewed one of my college text books that was written in 1971 and has a chapter that discusses CO₂ increase in the atmosphere. A chart was provided that shows CO₂ levels increasing with data obtained from 1955 through the book's publication date, and also shows a continuing increase into the future. When I looked at their estimates for CO₂ levels in 2009, it is almost exactly where our levels are today, or about .038% of the earth's atmosphere. Here's my question: exactly how does any gas of such minimal concentration in our atmosphere have any effect whatsoever on temperature? If I have a jar filled with air and the total number of molecules is 10,000, then about 7900 molecules will be N₂, more than 2000 will be O₂, the next highest number will be argon, then CO₂. The total number of CO₂ molecules in this example would be less than 4! How do 4 molecules of a gas out of 10,000 possible have any effect on trapping heat within the atmosphere? In the past 38 years we have gone from 3.6 molecules to 3.8 molecules of CO₂ (in this example). So 0.2 molecules increase (5.5% increase in CO₂ concentration) has resulted in the atmospheric heat rise of the past 38 years? Can someone give me some insight into the science behind CO₂ and global warming? (5/28/09)

A Dear Chalker Brown, We appreciate your question to the CDIAC Web site. Your question is a good one, with excellent analogies used. We are getting this question a lot lately! CO₂ concentrations since pre-industrial times has increased from about 280 ppm to about 385 ppm. Such a change is thought to exceed the range of fluctuations seen over hundreds of thousands of years (from ice core data). The reason such a large relative change is important is that CO₂ is the greenhouse gas whose "radiative forcing" effect is the largest. CO₂ is not the only greenhouse gas at work though; methane, nitrous oxide, and other gases contribute to the radiative forcing that is increasing the mean global temperature. If the earth was able to re-emit 100% of the energy it absorbs from the sun, things would stay in radiative balance and man-made global warming would not be a concern. However, the shortwave solar is of course converted to infrared energy, and while most escapes to space, the oceans are thought to be accumulating heat energy, and due to their thermal inertia are helping to create radiative imbalance and thus rising global mean temperatures. Since this has been happening for a good while now, there is significant warming already "in the pipeline". An incredibly complex issue to be sure. Without going on further, two of the best sources I know of to explain things are from the IPCC and from NASA's Dr. James Hansen. The first is a link, below. The 2nd is a paper I'll send under separate cover. <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> (see especially the first 7 sections) Happy reading. Critical thought on this issue is of course essential. You know that, given your training. Sincerely, Dale Kaiser CDIAC

[from Lianhong Gu] The ability of a molecule to trap heat depends on its structure and vibrational state, according to quantum mechanics. N₂ and O₂ are diatomic and have no electric dipoles and so do not trap heat (however, they do absorb and emit in the ultraviolet and visible regions of the electromagnetic wave spectrum). CO₂ is triatomic and its structure and vibrational state are such that it absorbs and emits heat (that is, infrared or long-wave radiation). So you cannot predict global warming by just counting the number of molecules. Lianhong Gu, R & D Staff Scientist, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831. Tel.: 1-865-241-5925. lianhonggu@ornl.gov

[reply to Dale from Chalker Brown] Dale, Thanks so much for your reply to my question. The college text book I referred to earlier was "The Limits to Growth" which was considered the definitive book of its time when I was getting my initial degree. You didn't mention the effect of water vapor and the oceans with respect to heat absorption and the regulation of atmospheric temperature. The greenhouse effect has been articulated for many years and there is scientific consensus on how it works. My issue is how microscopic levels of the various gases you mentioned (representing less than 1% total volume of our atmosphere) are now believed to be responsible for increasing global temperature. Where is the scientific evidence that CO₂, even though its concentration has increased, has any effect whatsoever at the minute levels at which it exists? There are many other potential causes for climate change but why the focus on CO₂? Thanks for forwarding Dr. Hansen's paper, which I have not read to date. I'm very interested in his evidence (as opposed to assumptions), which most "studies" tend to recount. In other words, man burns fossil fuel, CO₂ levels

increase(true), therefore we have global warming. It's that last conjecture that I've yet to find scientific evidence. Thanks again for your reply. It's really difficult to get people who are actively working this issue to be willing to openly discuss the science behind the hypothesis. Chalker W. Brown, Director, LSI (904) 779-6081

[reply to Lianhong from Chalker Brown] Lianhong, Thank you for the reply! I agree, my example was overly simplistic, other than to show the extremely minute quantity of CO₂ (.038%!!!) in the atmosphere as a whole. There is far greater H₂O vapor in the atmosphere than there is CO₂, so why no discussion on how H₂O absorbs and therefore performs significant regulation of temperature. Would you not say that H₂O provides a far greater effect on climatic temperature than does CO₂? Chalker W. Brown, Director, LSI (904) 779-6081

Q Dear Sir/ Madam, May I ask a question regarding the estimation method and detail procedure of CO₂ emission from a chemical process such as an electrical facility by using fossil fuel? Thanks a lot for the consideration and help in advance. Regards, Ling Yang (5/26/09)

A Hi: A 1984 paper by Marland and Rotty is considered the "classic" paper on these kinds of things, but that paper is not available electronically as far as I know. The attached paper ("method" section) may be enough to answer your questions. We also give the complete reference to Marland and Rotty (1984) in case you want to know more. TJ Blasing

Q Can I use your web site data for my research? Need the CO₂ emission amounts of Australia (5/26/09)

A Dear Kalani, We appreciate your question to the CDIAC Web site. There are no copyright restrictions associated with data presented on the CDIAC web site. All that we ask regarding publication is that one uses a citation that credits the actual investigator/contributor/compiler of the data. In the case of the data you refer to, this would be the citation at the bottom of this database's main page: http://cdiacornl.gov/trends/emis/tre_aus.html (The "CITE AS:" block at the bottom of the page.) Sincerely, Dale Kaiser, CDIAC

Q I need historical data to present for CO₂ productions for each of the source areas and total, into atmosphere, also rates at which input and output in atmosphere roughly, with regard to each sink and source. regard Anand (5/26/09)

A Dear Anand, We appreciate your question to the CDIAC Web site. Please check the following URLs on our web site for historical anthropogenic CO₂ data sources: http://cdiacornl.gov/trends/emis/overview_2006.html <http://cdiacornl.gov/trends/landuse/houghton/houghton.html> Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q How many metric tonnes of carbon dioxide emissions are required to raise the atmospheric concentration 1 ppmv? (5/25/09)

A To a first approximation, one petagram (a billion metric tons) of carbon (as carbon dioxide) retained in the atmosphere will increase the concentration in the entire atmosphere (stratosphere included) by 0.47 ppmv. As you worded your question (carbon dioxide instead of carbon), the answer is: 0.47 X 3.67 = about 1.42 billion metric tons of carbon dioxide retained in the atmosphere will increase the concentration by 1 ppmv. If you've had a chemistry course, you already know that the answer to your question depends on the volume we assume for "the atmosphere." The numbers I've provided are the conventional ones, although it takes some time for the CO₂ to propagate upward into the stratosphere and not every molecule remains intact there. Also, not all fossil carbon is retained in the atmosphere; about half is taken up by the oceans and terrestrial biosphere. Now you know the answer to your question, as well as why my children say: "If you ask Dad the time, he will tell you how to make a watch." TJ

Q Hello, My name is Daniel Mantilla. I live in Venezuela and I am at the end of my Environmental Engineering career at the Universidad Nacional Experimental del Táchira (www.unet.edu.ve). My country is what you called a third world country with a lot of political and economic problems, living in base of Oil industry and with very little concern about the terrible situation that our planet is going to, even that we have different laws to protect our environment we still don't have the education in the people to say that we are doing something. My career is a new career because some people is trying to make things better and the few people working in my area is working very hard to improve the way that we control the situation, but there is millions of problems like rubbish, people doesn't think in things like recycling, the factories don't have enough control of their gases and so on. To be able to finish my studies I have to do an Internship in a company and work in a specific area for 16 weeks. I have a little girl, she is just 5 years old, so I have been thinking if I could find a place where I can complete my requirements to get my degree but also get some knowledge to help in one of the many areas in trouble, maybe I will manage to have a cleaner environment for her to grow up in. I know of many things that big countries like yours are doing for other countries in the world please help us to have more control of what is happening to our earth, water and air because of poor education. Help us to prepare people like me that we have been in University for 5 years just dreaming and planning how we can save our planet. Please let me know if you have something available in any of the areas that I can help with, Thanks for your time and thanks for helping countries less lucky than yours, Looking forward to hearing from you, Daniel Mantilla (5/22/09)

A Dear Daniel, I appreciate your concern for the environment and for your native country, Venezuela. We have environmental issues in this country too! Our data center is a small group at a large national laboratory. Our laboratory is a great place to

work and internships are available. I encourage you to consider an internship at Oak Ridge National Laboratory. To learn more about such possibilities I suggest going to the following web sites... <http://www.ornl.gov/> <http://jobs.ornl.gov/> Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Are 2008 or 2007 GHG emissions rankings for all nations available for viewing and downloading through this website? Kindly advise (5/21/09)

A Preliminary values for 2007 are on the web site and are listed separately as preliminary values. They are not part of the listed national time series but appear in one file of preliminary values. Values for 2008 will be available around early July. Gregg

Q Is the data you have published on your site subject to copyright restriction? I am publishing worked solutions to an examination paper (2008 Discrete Mathematics published by the Curriculum Council) that includes an excerpt of some data sourced from your site (http://cdiac.ornl.gov/ftp/trends/CO2/lawdome_smoothed_yr75). In order to print it including your data, I need permission for the Association to do so, as I can see no indication on your website of it being copyright free. If you need any further information please contact me on my email address above (5/20/09)

A Dear Michelle, We appreciate your question to the CDIA Web site. There are no copyright restrictions associated with data presented on the CDIA web site. All that we ask regarding publication is that one uses a citation that credits the actual investigator/contributor/compiler of the data. In the case of the data you refer to, this would be the citation at the bottom of this database's main page: <http://cdiac.ornl.gov/trends/CO2/lawdome.html> (The "CITE AS:" block at the bottom of the page.) Sincerely, Dale Kaiser CDIA

Q Your web site http://cdiac.ornl.gov/epubs/ndp/ushcn/state_MO_mon.html I used this site last Nov/Dec to collect data from hundreds of US locations, all 100 years of Annual Average Temperatures for all years 1900-1999. Now I'm attempting to use the site for still more data. When I request the "Annual Precipitation" & also the "Annual Average Temperature", the column for "Annual Average Temperature" is I believe showing the "Annual Maximum Temperature" rather than the "Annual Average/Mean Temperature". What is wrong? Am I doing something which the site isn't set up to provide, or what is going on. For example, the location for Indianola Iowa, should have a "Annual Average Temperature" in the upper 40's or the lower 50's, but instead has data showing about 10 degrees warmer. I will appreciate your help. Thanks much. Wayne Byerly Nixa, MO (5/20/09)

A Dear Wayne, We appreciate your question to the CDIA Web site. If you will now try to get the data again I think you'll find things have been corrected. We apologize for this temporary problem, which we were aware of, and have been repairing over the past few days. Please don't hesitate to contact me directly if you find things are not "right". And we appreciate greatly your use of our site and your valuable feedback. Sincerely, Dale Kaiser CDIA kaiserdp@ornl.gov

Q Hi I have recently shown my 9 grade science class 2 videos suggesting completely different views relating to CO₂ and its influence on global temperature. One suggests that CO₂ concentration lags global temperature change and the other suggests the contrary position. My class have asked if they could see the raw data without anyone interpreting this for them so they can make their own minds up. I understand that you have access to the raw data from the VOSTOK ice cores and I was wondering if this is in the public domain in a reasonably simple form that they could analyse. Hope you can help. Gareth Salton and 9 SS1 (5/20/09)

A Dear Gareth, We appreciate your question to the CDIA Web site. Indeed we have the Vostok ice core data, along with other related Antarctic CO₂ and temperature records. And the format of the time series is indeed in a simple form: The Vostok CO₂ link is: <http://cdiac.ornl.gov/trends/CO2/vostok.html> And there are also Antarctic CO₂ data from the past several hundred years <http://cdiac.ornl.gov/trends/CO2/siple.html> and back to about 1000 AD: <http://cdiac.ornl.gov/trends/CO2/lawdome.html> Related temperature series deduced from oxygen and hydrogen isotopes at Vostok and Dome C may be found here: http://cdiac.ornl.gov/trends/temp/vostok/jouz_tem.htm <http://cdiac.ornl.gov/trends/temp/dome/dome.html> With regard to your videos and questions about the timing of CO₂ concentration and temperature swings deduced from ice cores, this is a somewhat contentious and complicated issue, as you have discovered. The best concise discussion of this question that I've seen is in a recent US National Academy of Sciences report: <http://americasclimatechoices.org/basics.shtml>....see page 10 of this pub. The linkage of CO₂ and temperature over the millennia is a quite a different beast than over the past 100-200 years. Hope the above helps. I consider it expert and authoritative. Regards, Dale Kaiser CDIA

Q I have been told that you have CO₂ emissions estimates for the US going back to the late 1800s. Is that correct and if so, where do I find the data tables (5/19/09)

A Dear William, We appreciate your question to the CDIA Web site. Indeed we do have the data you speak of. The main page for all CO₂ emissions data is here: http://cdiac.ornl.gov/trends/emis/meth_reg.html Drilling down on that page via the first link, "Global, Regional, and National Annual Time Series" will take you to any country's data, the US being here: http://cdiac.ornl.gov/trends/emis/tre_usa.html Sincerely, Dale Kaiser CDIA

Q | Dear Madamsand Sirs, I'm lookingfor data on the specificKrypton85 activityin the air of the northernhemisphere In the literature I found referencesindicatingthat the data shouldbe availableat your web site. However, I couldn't find them on your site. I kindlyask you for a hint in this matter. Thankyou very much! RegardsJens Richter(5/17/09)

A | We do not keep a Krypton85 data base. The attachedarticle may providesomeleads. T.J. Blasingt@ornl.gov Building 1509, Oak Ridge NationalLaboratoryOak Ridge, TN 37831 Phone (865) 574-7368 FAX: (865) 574-2232 THOUGHT FOR THE WEEK In theory, there is no differencebetweentheory and practice In practice there is.

Q | The R/V Thomas G Thompsonvessel data page is woefullyout of date. Pleasecontactmyselfof Eric King our port captain, for revisions (5/15/09)

A | Dear Mollie We appreciateyour comment to the CDIAC web site regardingthe R/V Thompson I have passed your comment and offer- thankyou! - along to Alex Kozyr who maintainsour Ocean web site. I am sure he'll be in touch soon. Thanksagain for taking the time to e-mail a note and your offer to assist. Sincerely, Tom Boden CarbonDioxide InformationAnalysisCenter Oak Ridge NationalLaboratory

Q | Could you please give me your most recentestimatesin GT/year of the current total (a) global emissionfrom fossil fuel consumptionand cement production, (b) net transferof carbon from atmosphereto land (excluding(a)), and (c) net transferof carbon from atmosphereto oceans Thankyou (5/14/09)

A | Globalemissionsfrom fossil fuels and cement up to 2006 are now on our web site (<http://cdiac.ornl.gov> and click on "fossil fuel CO₂ emissions" at the bottomright of the page) - plus preliminaryestimatesfor 2007. We shouldhave a preliminaryvalue for 2008 by mid July. For your other two questionsI am going to suggest lookingat a web site that sits right there in Australia (www.globalcarbonproject.org). They provide the most current estimatesof the global carbon balance Gregg Marland

Q | Please, I need data about emissionsby contries (ranking by year. I dont have data of 2007 until 2009 years. Are there a link where I look for (ou see) this? thankyou. (5/14/09)

A | Dear Rene, Thankyou for your e-mail to the CarbonDioxide InformationAnalysisCenter (CDIAC) web site. I trust you have seen our nationalemissionestimatesfrom fossilfuel use and cement productionthrough2006 at http://cdiac.ornl.gov/trends/emis/tre_coun.html and our preliminary2007 global estimatesat http://cdiac.ornl.gov/trends/emis/meth_reg.html U.S. emission estimates through 2007 are available from the U.S. Department of Energy at <http://www.eia.doe.gov/oiaf/1605/ggrp/index.html> There may be more recent "preliminary" estimatesavailableelsewherebut there is typicallya two-to-three year lag between the last year of necessaryenergy data and the actual calendaryear. Do you have 2007-2008 estimatesfor Brazil? Sincerely, Tom Boden CarbonDioxide InformationAnalysisCenter Oak Ridge NationalLaboratory

Q | Hello, I am trying to find a historicaldata set (since 1998 until the latest possible) of the precipitation(could be an index) in China and India. Is there anywhereI can find this throughthe website? If not, can you indicateme where is this data available or send it to me? Thankyou Clarissa Berman Consultant | Research Avenida Brig Faria Lima, 3600 | Floor 06 Sao Paulo, 04538-132 Phone +55 11 3048-6214 Clarissa.Berman@morganstanley.com (5/13/09)

A | Clarissa, The Global HistoricalClimatologyNetwork (GHCN) databasecan be accessed at the individual-stationlevel here <http://www.ncdc.noaa.gov/oa/climate/ghcn-monthly/index.php> There is a lot of functionalitywith this site, includingthe ability to make maps and time series. You might find the attachedpaper interestingregardingChina, and it may have referencesto actual data set that are available. Regards, Dale Kaiser CDIAC

Q | Sometimeago, I asked about the percentageof CO₂ in the atmospherethat was caused by cement productionand fossilfuel combustionand was told it was 14%. Has that changed? (5/12/09)

A | I don't think it is possibleto answeryour questionsquite so simplybecauseof the complexityof the global mixing of carbon dioxide through the atmosphere, biosphereand oceans. What we can say is that prior to the industialera the concentrationof carbon dioxidein the atmospherewas about 285 parts per million by volume. It is now about 385 parts per million. The difference is a consequenceof burningfossil fuels, manufacturingcement, and oxidationof carbon from plantsand soils. Gregg Marland

Q | Dear Gregg, Could you explaineme what you mean by saying "We assumethat a fractionof plasticsare not oxidized, regardles of where they are."? SincerelyKoji(5/8/09)

A |

[not sure what Gregg's answer was, but this came in from Koji] Dear Gregg, Many thanks for your following answer. Although we are unable to follow the exact fate of all plastics, we assume that, on average, some fraction is not oxidized so that the total stock of

plastics on Earth increases I agree with your opinion! Sincerely Koji

Q I'm looking for a long data series on 'deforestation' emissions I have one from 1850 but cannot now locate the source. Many thanks (5/7/09)

A Dear Prof. Fildes Please look at our Houghton land-use emission estimates dating back to 1850, at <http://cdiacornl.gov/trends/landuse/houghton/houghton.html> Was this the source? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center oak Ridge National Laboratory

Q In our atmosphere the proportion attributed to CO₂ is said to be 0.03%. In an enclosed crowded arena, church or athletic event of lengthy duration, what does that % increase to from normal human exhalation? (5/6/09)

A Dear Gerald, We appreciate your question to the CDIAC Web site. I honestly don't know of measurements taken during sporting events or at other crowded venues. We ran an eddy covariance system in our building for several weeks one summer in a room of office cubicles housing summer students. The EC system captured the weekly, daily, and hourly features nicely. With five students present, the CO₂ levels would rise from ambient (360-380 ppm) to highs between 700-800 ppm. Effects of ventilation were also evident. My guess is the CO₂ concentration could easily rise above 1000 ppm at crowded events. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q > Thank you for your Web site. >> Please let me know how to access the USHCN data. The USHCN was brought > to my attention during remarks by Prof. Clarence Lehman, University of > Minnesota during a meeting of the "Mathematic of Climate Change" > seminar. During the discussion, questions arose on various questions > about how to estimate the locations of ecotones. I hope to make some > small contributions to that. I hope the data are available in "ordinary" > online CD-ROM, DVD, computer-accessible formats >> Max Jodeit > Professor Emeritus > School of Mathematics > University of Minnesota Twin Cities (5/6/09)

A Dear Max, Please see the USHCN web page here: <http://cdiacornl.gov/epubs/ndp/ushcn/newushcn.html> where daily or monthly data are available. The most recent data are a few years old and we're in the process of updating through 2008. If you need data through 2008 faster, they are available station by station (without as handy of a user interface though) through the National Climatic Data Center (<http://www.ncdc.noaa.gov>). As you look through our HCN site, you'll want to read our modest amount of documentation and the graphical user interface (GUI) will be even easier to use. Just holler with any questions. Regards Dale Kaiser CDIAC

Q can the carbon in CO₂ be taken out to leave nothing but carbon and O₂? (5/5/09)

A You can, of course, but it takes a lot of energy. The reason we combine carbon and oxygen to produce CO₂ (for example by burning coal) in the first place is that we want to get the energy out to run our cars and other machines. Gregg

Q Can you direct me to calculation procedures for estimating CO₂, NO₂ and SO_x emissions from electric power plants and coal-fired heating plants? Thank! Paul (5/5/09)

A For CO₂ the ultimate authority these days is the IPCC Guidelines on National Greenhouse Gas Emissions. Go to www.IPCC.ch, click on reports, methods, and then the 2006 Guidelines. The Guidelines are in 4 volumes, energy is in volume 2. NO₂ and SO_x depend on the power plant, the control equipment, and the coal. The US EPA may have some average values on their web site, but the insight is going to be limited. Gregg

Q Dear Gregg, How are the CO₂ emissions from MSW (municipal solid waste) combustion counted in your data-base? Official opinion of the German Government 55-60 wt-% of MSW is bio-origin, i.e. climate neutral (This percentage differs from country to country!) I think this percentage of CO₂ emissions from MSW does not need to be counted for considering the climate change. Sincerely Koji (5/4/09)

A Koji, We do not explicitly treat MSW at all. Since we work primarily from the side of fuel production ("apparent consumption", not consumption data), we have an approximation for the fraction of fuel that is produced but not subsequently oxidized. "Not oxidized" includes the idea that some fossil fuel will be used for things like plastics that are never oxidized in landfills. As you well know, the fate of these materials differs very much from country to country, so we basically use a global average estimate for all countries. Gregg

Q Hello, one of our system users asked us where she can find c-13 data after 2001. I checked and I can only see Carbon-13 data up until 2001 in the CDIAc system. Do you know of a source with c-13 data post 2001? Thank you Scott Ritz Atmospheric Science Coordinator NASA GCMD (5/4/09)

A Scott Please find attached db1013.DAT.2005 which has data through 2005. The data shown is our best estimate for the del 13 C signature of global fossil fuel emissions by year. Robert Andres

Q Would dyeing carbon dioxide gas to a lighter color keep earth's troposphere from capturing as many heat rays, like the difference between blacktop asphalt and other light-colored heat-reflecting surfaces? (5/1/09)

A

[Gregg should get some kind of reward for this one] Carbon dioxide is a colorless, odorless gas that just happens to absorb heat radiation. You might think of heating water in a microwave oven as an similar process. Microwaves will heat anything that has water in it. Gregg

Q I read the answer to a question about the CO₂ from human respiration, that because humans draw their carbon from the food they eat, the CO₂ they emit doesn't actually add to the CO₂ in the atmosphere (I think that's what it said.) Is that the same as creating CO₂ by burning lumber? There's no additional CO₂ created? Can you contrast the two? (4/30/09)

A Dear Stuart Hagen, We appreciate your question to the CDIAc Web site. The wood-burning issue is not really the same as the human respiration process. The lumber is sequestering (storing) the carbon until it rots or is burned. Once it is burned it becomes a source of CO₂ that is not counterbalanced until something else sequesters that CO₂, like newly planted trees - the uptake of which is related to the type of tree, its growth rate, size, age, etc. In contrast, the human CO₂ cycle takes place at a generally faster pace because we are consuming seasonal crops, thus keeping things in much closer balance. Also, please see the last sections of this page: http://www.epa.gov/climatechange/emissions/CO2_human.html Sincerely, Dale Kaiser CDIAc

Q I have been looking for the following publication online Rotty, R. M., Estimates of seasonal variation in fossil fuel CO₂ emission Tellus 39B, 184-202, 1987. Only I can't even find the abstract anywhere. The whole article would be preferable - is it possible you could provide it, or tell me where it is located? Thank you, Alice Hooker Stroud (4/30/09)

A Alice Hmmm! That is a hard one to find. You can order a copy from: http://chemportcas.org/cgi-bin/sdcgr?APP=cp_stneasy&SERVICE=STN&CLF=stneasy&SID=74361-0352373402200&FID=REDISPLAY&LANG=english&R=946080&DLP-REFERER=&DLP=1 OR If your library subscribes to Tellus back to 1987, they have e-copies. OR If all else fails, I can xerox a copy of my hard copy and send it by post. I'll need your complete address if you choose that option. We have a paper coming out in J. Clim. Appl. Meteor. (one of these days) on the annual cycle of CO₂ emissions from North America. T.J. Blasing

Q Some of my colleagues disparage the IPCC warnings about global warming because they say the models do not use a sufficient range of economic assumptions. Please tell me where can I find a table (not a figure) of the lowest tropospheric CO₂ concentration (derived from the emission scenario) for each year or decade used as an input for the 23 (?) different IPCC models in the 2007 report. (4/28/09)

A Dear Frank Shann, We appreciate your question to the CDIAc Web site. Courtesy of CDIAc's Gregg Marland - "The IPCC Special Report on Emissions Scenarios is available at the IPCC web site (www.ipcc.ch), and I believe this information is available as tables in the appendices." This looks to be the case. I believe the specific report/link is: <http://www.ipcc.ch/ipccreport/sres/emission/index.htm> Sincerely, Dale Kaiser CDIAc

Q At the bottom of this page (<http://cdiac.ornl.gov/faq.html#Q2>) The link to Scientec Matrix is broken. Scientec Matrix (<http://www.scientecmatrix.com>) is "a community of over 1000 scientists and technologists working on subjects as diverse as clean energy production from waste." (4/27/09)

A Dear David, Thanks for taking the time to bring a temporary broken link to our attention. Their Scientec Matrix site is now back up and running. Thanks again for alerting us. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q How much is the influence of varying amounts of CO₂ in the atmosphere to global warming, particularly in the 0-500 ppm range (I note that currently the CO₂ is about 350 ppm and rising by about 2.5 ppm per annum) (4/27/09)

A Dear Henry Pool, Try: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf For a good summary of CO₂ effects on climate. Sorry about the delay in answering, somehow this didn't get to me. Sincerely, T.J. Blasing

Q 1. I'm wondering about separating C from O₂ in CO₂. For example NaCl (salt) can be separated into Na and Cl in a solution by applying an electric current between a cathode and anode through the solution. Could CO₂ likewise be percolated through a solution to separate its respective elements. Forgive me if this sounds crazy but having been a power plant mechanic the following thought crossed my mind ten minutes ago. I envisioned fans (equivalent to or larger than the forced draft fans that supply a coal fired boiler) taking their suction from stacks and forcing that prodigious amount of air into a solution that would precipitate out or electrically remove the carbon. Thanks Mike (4/27/09)

A Mike please see these A on our FAQ page: <http://cdiacornl.gov/faq.html#Q22> for a practical assessment of this idea. You may find the other FAQs of interest also. Dale Kaiser CDIAC

Q Dear Dale, Several months ago, you kindly provided me with monthly-averaged SLP data for San Francisco for the period from 1941 to 1988. This data has been very helpful and now I am wondering if it would be possible to get monthly-averaged SLP data for San Diego. Since I use this data together with sea level data for the same location, the sea level at San Diego goes back to 1906, but is it possible that SLP data go back that far at this location? Any help will be greatly appreciated. Thanks Larry Breaker (4/27/09)

A Hi Larry, Attached are two files w/ the same format as before. San Diego has a missing period you'll see, so I've attached LA too, but it ends in 1970. Hope it is some help anyway. Dale

Q Is there any place where I could find the total world CO₂ emissions that JUST come from coal mine fires? The closest thing I could find was that the coal mine fires in China contribute anywhere between 1-4% of world CO₂ emissions from fossil fuels, but I'm trying to figure out what percentage of world CO₂ emissions can be attributed to all of the coal mine fires in the world. (4/27/09)

A Steve, I have tried to find this number in the past - but without success. Numbers like you find for China seem to be about and one can get estimates for the US, but after that it is tough sledding. Gregg

Q I understand that carbon 14 dating can be used to determine the distribution of natural CO₂ versus mined carbon/oil and volcanism. That is, forest fires, for example, are relatively "new" carbon, whereas coal, oil, and carbon dioxide from volcanoes has been sequestered in the earth for millions of years and therefore would have much less carbon 14. What part of carbon in present atmospheric carbon dioxide is from sequestered sources such as oil, gas, methane (which converts to CO₂ in a few years), coal, and volcanism vs. that from decaying vegetation, forest fires, and animal flatulence? (4/27/09)

A Michael, Good question and I am sorry I do not have an equally good answer for you. To paraphrase your question, you asked what percentage of carbon dioxide in the present atmosphere is from new carbon sources relative to old carbon sources (where new and old are determined by carbon-14 isotopes)? I do not know of any atmospheric measurements that will directly answer this question for you. However, there has been much study on sources and sinks of carbon to and from the atmosphere. A summary diagram and discussion can be found at <http://www.ipcc.ch/pdf/assessmentreport/ar4/wg1/ar4-wg1-chapter7.pdf> with the diagram found on page 17 of that chapter (page 515 of the full report) and the discussion on following pages. Carbon-14 plays a small role in the determination of these budgets. Carbon 12/13 ratios as well as other measurements play a much larger role in the determination of these budgets. I hope this answer helps answer your question. Sincerely, Robert Andres

Q Where can I find a database of content of carbon dioxide in the atmosphere? (4/24/09)

A Dear Shveykina, We appreciate your question to the CDIAC Web site. CDIAC has many databases containing measurements of atmospheric CO₂ concentration. Please see this page on our site: <http://cdiacornl.gov/trends/CO2/>. If you have additional questions, we are at your service. Sincerely, Dale Kaiser CDIAC

Q I saw some data on annual fossil fuel CO₂ emissions from about 1800 to 2005, for several countries. Can you provide a data set in Excel? Have you used a decay curve (Jim Hansen has one, for example) to compute "decayed" or residual CO₂ emissions remaining in the atmosphere, say since 1800? (4/24/09)

A Gerry: The data through 2005 are readily available at: <http://cdiacornl.gov/trends/emis/overview.html>. You will probably want to download it as txt and save it as xls. You're welcome to download it and do whatever calculations/graphics you like. TJ Blasing

Q Why has a 1,280% increase in total Fossil Fuel Combustion only resulted in a 30% increase in the residual Atmospheric Carbon Content since 1850? (4/22/09)

A The global cycling of carbon is a complex of many interrelated processes. The atmosphere exchanges carbon with the terrestrial biosphere and with the ocean in a variety of physical, chemical, and biological processes. The "natural" balance of processes is unbalanced when we start burning fossil fuels. But when one component of the "balance" is changed, this imbalance cascades through the full system and all of the processes are affected. Scientists have built detailed computer models to try to examine how

Q > Hi, I am trying to find a current statistic re the spring frost free > date for Marion County (use zip code 50138). Do you have that info? > I've googled, etc. but haven't found it. Maybe you have? Thanks Karen > > > Karen Ackley > > Ag/Horticulture Assistant > > Marion County Extension > > 1445 Lake Drive, Suite 2 > > PO Box 409 > > Knoxville IA 50138-0409 > > 641-842-2014 > > kackley@iastate.edu (4/22/09)

A Dear Karen, I am guessing the best and quickest way to dig up this info. is through data summaries posted by the Des Moines NWS office <http://www.crh.noaa.gov/dmx/> If these don't exist on that site, there should be contact info. on that page so you can call someone up at the office and they can point the way. I bet this info. is available for area locations, but can't say specifically for Marion County. I'd be very interested in whether you are able to get the info. from them. Pls. let me know. And, if no success I'll try to think of other routes. I'm sure we can meet w/success one way or another Regards Dale Kaiser CDIAC

Q Aloha I'm wondering if anyone has looked at the metadata for COOP stations in Hawaii or US affiliated Pacific Islands to determine which ones would fit the criteria that were used to select USHCN stations I'm working on a weather/climate protocol for national parks in the Pacific (Hawaii, American Samoa, Guam, and Saipan) and it would be interesting to know if there are any stations on these islands for which data are considered reliable enough to detect regional climate change many thanks Karin (4/21/09)

A Dear Karin, Sorry to not have responded sooner. This is a very interesting question and one I'm afraid I don't have an answer to. At least for Hawaii, you might ask the folks at the Western Regional Climate Center: <http://www.wrcc.dri.edu/> or someone directly at NCDG <http://www.ncdc.noaa.gov/oa/about/ncdccontacts.html> I'm not familiar with details for stations in the Pac. Islands, but someone at NCDG could probably offer advice. Regarding the USHCN criteria, I don't think the NCDG scientists are as "hung up" as they used to be on a station meeting *all* of the historical criteria to be useful for analysis. Granted, this could be mainly due to the fact that the recently released v2 of USHCN does tons of neighbor checks to adjust the heck out of all the data so that the odds of a real clunker being retained are smaller. The PI on v2 of USHCN, Matt Menne, is a very helpful guy and may be able to guide you, especially considering the nature of your important work. Regarding USHCN v2, see: <http://www.ncdc.noaa.gov/oa/climate/research/ushcn/> I'd be interested in knowing anything you find out. I hope this helps at least a little bit. Dale Kaiser CDIAC

Q Hi - I think you gave an incorrect response to how much CO₂ is emitted for electric use in the home. You said: In general, the coefficient is about 2.3 lb CO₂ per kilowatt-hour (kWh) of electricity. You can calculate the kWh of electricity by multiplying the number of watts (W) the appliance uses times the number of hours (h) it is used, then dividing by 1000. For example a 60-W light bulb operated for 24 h uses (60 W) x (24 h) / (1000) = 1.44 kWh. This use of electricity would produce an emission of (1.44 kWh) x (2.3 lb CO₂ per kWh) = 3.3 lb CO₂ if the electricity is derived from the combustion of coal. [RMC] However, 2.3 lbs per kWh is at the utility company not at your house. The utility is about 33 % efficient and thus it needs to burn 3 units to get one to your house. So if a house uses 1 kWh then it is 3 units at the utility times 2.3 lbs/kWh. This is a big difference from your response. Am I correct? (4/20/09)

A Dear Bill, Thanks for your question. First of all, the FAQ page says "1.3", not 2.3, correct? Nonetheless, regarding the coefficient, I'm betting that the efficiency issue you mentioned is already factored in, but can't say for sure. I've not been able to dig up the Barnwell article yet, but I've copied a colleague on this in case they can enlighten us. Dale Kaiser CDIAC

Q Can you tell me a website where I can find the relationship between Earth surface temperature rise and concentration of greenhouse gas? I've read that it is logarithmic (4/18/09)

A Dear Allan D. Halderman, We appreciate your question to the CDIAC Web site. While there is no simple relationship (e.g., an equation including the 2 variables) that can describe global mean surface temperature and greenhouse gas concentrations, CO₂ concentration can generally be described as increasing exponentially since the start of the industrial revolution. However, global mean temperature since it began its dramatic upswing in the 1800s is not really increasing exponentially. There have been a few ups and downs, and even semi-flat periods, but the dominant trend is strongly upward. Sometimes these two variables are plotted on the same graph, but the emphasis is simply to show the positive correlation that climate scientists think results from a very real physical relationship in which CO₂ concentrations influence global temperatures. The relationship (for both conditions over the past century or so, AND into the future) is largely studied using many types of climate models. Rather than gather and paste many links here to specific graphics I'll point you to the main web page of Working Group I (concerned with the physical science basis of climate change) of the Intergovernmental Panel on Climate Change - the best overall authority on all things climate. Along with the front matter I would recommend you look at sections 1-3, to start <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> Sincerely, Dale Kaiser CDIAC ----- Can you tell me a website where I can find the relationship between Earth surface temperature rise and concentration of greenhouse gas? I've read that it is logarithmic

Q I am a 5th grader at TOPS in Seattle. I am studying about the ozone layers. I was wondering what effects the ozone layers' depletion might have on penguins and other sealife? Can we repair the hole in the ozone layer? If yes, what has been done? And how long would it take to repair it? Thank You, Kino Chew the role of the terrestrial biosphere and the oceans in the

biogeochemical cycles of greenhouse gases, emissions of carbon dioxide to the atmosphere, long-term climate trends, the effects of elevated carbon dioxide on vegetation, and the vulnerability of coastal areas to rising sea level. (4/17/09)

A Dear Kino Chew, Depletion of the ozone layer is not good for any organism with surficial tissue (skin, for humans, feathers for birds) that is sensitive to ultraviolet radiation. The ultraviolet radiation comes from the sun, so organisms living deep in the ocean would be better protected. We are reducing emissions of halocarbons, which are chemicals containing halogens and carbon. Halogens are mostly fluorine, chlorine, bromine. Halocarbons are industrial compounds used for dry cleaning, fire extinguishers, foam blowers, and many other things. We are finding replacements for these chemicals. Sincerely, TJ Blasing

Q From the graphs, it is obvious that there is a correlation between carbon dioxide and global temperatures, but what makes scientists believe that the carbon dioxide is causing the warming and not the warming causing an increase in the carbon dioxide? (4/17/09)

A Ken, I do not know your educational background, but the US National Academy of Science has recently produced a nice little booklet that is easy to read and does a reasonable job of explaining some of the basics of climate change. You can download it from their web site <http://nationalacademies.org/climatechange>. It is listed at the bottom left of their web page and is called "Understanding and responding to climate change". If you want some more technical explanations, the reports of the Intergovernmental Panel on Climate Change are excellent and can be found at their web site www.ipcc.ch. Best wishes, Gregg Marland

Q Thank you for the information Dale, I guess I neglected to actually ask the second part of my question and that is "on a molecular basis what value is typically assigned to a water molecule in terms of its adsorption of IR radiation?" It seems most molecules are assigned a GHG equivalence relative to carbon dioxide (i.e., $\text{CO}_2 = 1$) so the typical number I find for N_2O is 310. Thus on a molecular basis N_2O is 300 times as "potent" as CO_2 etc. But for some reason the corresponding number for H_2O seems to elude me. It must be known otherwise no one could know that for example water vapor is responsible for 80 - 95% of the warming effect. Likewise, I would think it would be easy to measure by looking at the IR or Raman absorption spectra - but again I did not find it. On the other hand I am a biochemist not a climatologist so I'm probably looking in the wrong place. If you have an insight into that value I would appreciate it. Thanks again and thanks for the great site, Bernie Daniel, Ph.D. Senior Environmental Scientist National Exposure Research Laboratory Office of Research and Development U.S. Environmental Protection Agency 26 West ML King Drive Cincinnati, OH 45268 Tel: 513-569-7401 Fax: 513-569-7609 E-mail: daniel.bernie@epa.gov (4/17/09)

A Bernie, I too have not seen a Global Warming Potential (GWP) assigned to water vapor and have read various things as to why it's an apples to oranges thing compared to the trace GHGs. I think some of it has to do with atmospheric lifetime estimates. H_2O is recycled through the earth-atmosphere system very quickly, to a large extent. That's probably part of it. I'm thinking that you might want to check chapter 2 of the IPCC AR4: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>. I would go with whatever their explanation is, IOW, I have high confidence in the assessments of my more learned colleagues Dale.

Q Do you have any estimates on how much CO_2 can be captured using CCS technologies in the short, medium and long term in the UK? (4/16/09)

A This is out of our normal realm, but if I were researching this question I would start by looking at the report of Nicholas Stern from a couple of years ago and see if he has any useful numbers. If you do not know this report, you can find it easily by Googling "Stern Review". Best of luck, Gregg Marland

Q Hello, Thanks for the information on current (greenhouse gas concentration) GHG concentrations - however could you also supply your current best estimate of the water vapor as well? I realize this gas concentration is sensitive to the distance above the planet surface (and season) - but if you could, I would appreciate some "ball park" yearly average estimate of the water vapor concentration below 1.5 km (above sea level) and that below 5 km (above sea level). Thanks much! Bernie (4/15/09)

A Dear Bernie Daniel, We appreciate your question to the CDIAC Web site. Most of the research in developing a climatology of atmospheric water vapor involves radiosonde or satellite observations. Unlike CO_2 or CH_4 , water vapor is typically expressed as a partial pressure, rather than something like ppmv. As you note, geographic location, season, and altitude make water vapor pressure extremely variable, ranging from near zero to several tens of millibars (mb). For reference, mean sea-level pressure is often assigned a value of 1013.25 mb. Here are some links to various databases, research, and projects where water vapor monitoring is involved: <http://www.ncdc.noaa.gov/oa/climate/igra/index.php> http://www.agu.org/sci_soc/mockler.html <http://www.gewex.org/gvap.html> <http://www.atmos.arizona.edu/~kursinski/WVRremoteSensingHydroCycle.htm> [http://ams.allenpress.com/perlserv?request=get-abstract&doi=10.1175%2F1520-0442\(2004\)017<2541%3AAAYCOO%2.0.CO%3B2](http://ams.allenpress.com/perlserv?request=get-abstract&doi=10.1175%2F1520-0442(2004)017<2541%3AAAYCOO%2.0.CO%3B2) Sincerely, Dale Kaiser CDIAC

Q I'm taking an Energy Management course at Texas State University and would like to make a graph regarding the relationship between CO₂ emissions and global temperature using EXCEL. Can someone help guide me through the process of getting the data into EXCEL? (4/15/09)

A If I understand correctly, you are referring to a file such as the one here perhaps http://cdiac.ornl.gov/ftp/ndp030/global.1751_2005.ems In your web browser, if you click on "file", then "save as" or "save page as", then tell it where you want the file, it will save it there. If you are using the IE browser, you should probably tell it you want it saved as a "text file" in the "save as type" drop down menu. Once you save it, you can open it with Excel. It will probably ask you about the original data type. It will probably have "delimited" chosen - just keep that and click "finish". You'll just need to clean up the header/title information if you want to keep it in the file. In addition, note that the Per Capita column doesn't have values until 1950, so you may need to do some editing of previous years (setting to "0", or whatever). This advice should get you close! Good luck, Gregg Marland

Q > Dear Sir >>> I would like to know where I can find Indonesia's total carbon emissions - > industry and land use change >>> Please can you send me a link. >>> Yours faithfully >>> Clare McGowan >>> Clare McGowan >> Phone +33 (0)5 59 23 01 94 >> Mobile +33 (0)6 86 43 77 69 (4/14/09)

A Clare, Sorry to be slow with this reply. Regarding fossil fuel combustion emissions, that one is easy, please see: http://cdiac.ornl.gov/trends/emis/meth_reg.html ...several of the links near the top of the list. Regarding land use change, that's a little bit different animal and I'm not aware of a country breakdown, but there are historical regional estimates. Please see: http://cdiac.ornl.gov/by_new/bysubject.html#landuse Hope this helps, Dale Kaiser CDIAC

Q Hi, I was wondering if you could answer one of my questions please. I checked the per capita emissions for my country, Peru, and it shows 0,36t per capita for 2005, however I checked the per capita statistics at the UNSTATS till 2004 and it shows 1,16t per capita for 2004. I am a little confused with those numbers. I cannot believe we have had that dramatic reduction on the emissions. What I think or my question is, the 1,16t for 2004 is based in a total emission of carbon and the 0,36 for 2005 is based in only fossil fuel emission? if that's the case... could you please give me the information of the total carbon emission per capita for Peru from 2005 to 2007? thank you sincerely, Carla Cano (4/14/09)

A Carla, the UNSTATS reports emissions of carbon dioxide in terms of the mass of carbon dioxide. Our reports show the emission of carbon dioxide in terms of the mass of the carbon in the carbon dioxide. It is a little subtle, but I think that both reports are clear if you know what you are looking for. The result is that their number should be larger than ours by the ratio of the molecular mass of carbon dioxide to the atomic mass of carbon (44/12 = 3.67). Both numbers are entirely correct; it is just a matter of how you want to look at the issue - and it is very easy to convert from one to the other.

Q What a bunch of shit. Who's paying for this data? (4/12/09)

A Dear Karen, Our data center is supported by the U.S. Department of Energy. The research and monitoring data we archive and make available were supported by numerous national and international agencies, ministries, universities, foundations, etc. (e.g., NASA, USDA, NSF, EU). Any particular data at our center or absent from our center that drew your ire? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I need information about "carbon dioxide concentration in the atmosphere". for example carbon concentration in rural, urban and industrial areas in Melbourne Australia. Regards Gihan (4/11/09)

A Dear Gihan, One of the best measurement groups in the world is CSIRO in nearby Aspendale. They make CO₂ measurements around the world (http://gaw.kishougo.jp/wcc/CO2/expert/pdf/annex_aus.pdf) and likely nearby as well for a variety of purposes. I suggest you contact them for additional details on their measurements in and around Melbourne. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q > Thank you, (referring to question #13) but ~ 1 kg of exhaled carbon > dioxide per day per person times ~ 7 billion people is a lot of > carbon dioxide! What I had asked, perhaps not too clearly, is what > part of the recent increase in atmospheric carbon dioxide can be > attributed to the increase in the world population for the past > decade (or for the past period during which atmospheric carbon > dioxide and world population increase has been measured) ... or can > such a correlation even be teased out of the data! >> Richard D. Stacy > ----- > ----- >> On Apr 8, 2009, at 8:29 AM, kaiserdp@ornl.gov wrote: >>> We appreciate your question to the CDIAC Web site. >>> Please see question no. 13 on our FAQ page for the correct way to >> think about this issue >>> <http://cdiac.ornl.gov/faq.html> >>> Sincerely, >>> Dale Kaiser >> CDIAC (4/11/09)

A Richard, Here is the point though, from the A to the FAQ... this carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere. Even if this were not the case, (but it IS the case), some scale analysis can be done. Fossil fuel emissions, global, per year, 2005 = about 8 X 10⁹ metric tonnes, or about 8 trillion kg of carbon PER YEAR. Then, take for example a population increase (over some number of decades) of 1 billion folks times 1 kg CO₂

(or about .3kg C) times 365 days/year, or about 110 billion kg of C per year. A factor of about 75.

Q I would like to get the data for this graph, which I can not find on your website <http://www.fhwa.dot.gov/planning/metro/bostmpofig1.htm> Anthropogenic emissions over time. I hope you can help. Thank you! (4/10/09)

A Cheryl See: http://cdiacornl.gov/trends/emis/tre_glob.html Which has the data through 2005 in EXCEL. Let me know if you have any problems. TJ Blasing

Q What is the mass of CARBON in a Gigatonne of CARBONDIOXIDE? (4/9/09)

A A gigatonne is 10 to the ninth tons and carbon dioxide is 12/44 carbon (ratio of the atomic mass of carbon to the molecular mass of CO₂). So the answer is .2727 times 10 to the ninth power tonnes. Gregg

[from Lianhong Gu] In a gigatonne of carbon dioxide there is $12/(12+32)=0.273$ gigatonne of carbon.

Q Re your CCNet comments today- the alarmists need to be held to this fundamental issue of why are we trying to limit CO₂? For what scientific reason? A protest against carbon/CO₂ cap and trade or tax proposals. This summary is being sent to politicians, media outlets, scientists, and others across the world. It is a protest against the madness of anti-carbon thought and policies. The Basic Science of Carbon/CO₂: a brief summary (Why are we trying to limit- cap and trade, tax- the basis of all life?) All life is built from carbon. All life depends on carbon for its existence and functioning. "All living things, starting at the cellular level which is common to all life, is based on carbon compounds including the DNA that carry the gene sequences of the genetic codes. Of the trillions of cells in the human body, there is not one of them that is not made of carbon" (see article by Bob Brinsmead The Vindication of Carbon- at www.bobbrinsmead.com). We subsist almost entirely on carbon dioxide. "The food used by all living things, to grow and to live, is carbon dioxide..food is carbon dioxide..the food of all plants and animals is carbon dioxide" (http://www.bydesign.com/fossilfuels/greening_benefits/miracle.htm). Everything is made of carbon and fueled by carbon. All things need carbon to grow and reproduce. There is only one source of carbon for all life- CO₂ in the atmosphere. Plants absorb CO₂ from the atmosphere ("they consume almost entirely carbon dioxide for food"- www.bydesign.com) and process it into carbohydrates for the animal kingdom. We get our food from this chain of CO₂ /carbon processing. "The only gateway through which carbon can enter the food chain to enable the biosphere to exist is through the carbon dioxide in the atmosphere. There is no other way. It all starts with CO₂ in the atmosphere. The entire chain of life starts with plants absorbing this entirely natural, colorless, odorless, absolutely non-toxic aerial gas called CO₂ ...more than 90 % of the dry matter of plants is simply processed CO₂. Whether it is a cow eating grass or humans eating cows, all are eating and being fuelled by processed CO₂" (Brinsmead The Vindication of Carbon). Recent levels of CO₂ in the atmosphere have been unprecedented and dangerously low. Plant growth shuts down at 200 ppm (parts per million in the atmosphere). Plant life is stressed and unhealthy at such low levels. Life evolved over the past 500 million years at levels of CO₂ that were on average a more healthy 1500 ppm (see paleo-climate graphs at sites such as Geocraft.com). A dangerous upper limit of CO₂ in the atmosphere would be from 5,000 to 10,000 ppm (http://www.theroadtoemmaus.org/RdLb/11PhI/Sci/CO2_Health.html). We are in no danger of approaching these high levels. Our atmosphere is currently "CO₂ deprived". Plants and crops are healthier at higher levels of CO₂ than are currently present in our atmosphere (now 386 ppm). They produce significantly more biomass and are able to cope better with such natural vagaries as drought, heat, and cold (<http://uddebatt.com/2008/04/01/the-wonderful-benefit-of-CO2/>). "More CO₂ makes plants more resistant to extreme weather conditions..and this expands the habitat of many plants..and enhances agricultural productivity..and helps tropical rain forests" (<http://www.nationalcenter.org/NPA334.html>). Animals also survive better with more plant life. The small increase in CO₂ over the past century has significantly greened the earth and this has increased populations in the animal kingdom. It has also enhanced the impacts of the Green Revolution with notably increased crop production which has helped to feed the poor. Higher levels of CO₂ in the atmosphere are more normal and natural. Current world average temperatures are also abnormally low. Higher temperatures on an ice-free earth (a warmer earth) are more normal and natural (see paleo-climate graphs at Geocraft.com). We are in one of earth's infrequent and abnormally cold ice-age eras (the past two million years). A warmer earth would be better for all life. CO₂ is not a pollutant but is a rare gas (1 molecule to every 3,000 molecules of the atmosphere) that is the essential food of all life. "All plants and animals are growing and living on a rare gas" (www.bydesign.com). And while there are other potential pollutants associated with fossil fuel use, CO₂ and carbon are not among them. CO₂ does not cause dangerous global warming. Rising levels of CO₂ follow warming periods and do not precede or cause warming periods. See the Vostok Ice Core research at <http://www.CO2-science.org/articles/V6/N26/EDIT.php>. Oceans which hold 90 times the CO₂ that is in the atmosphere release CO₂ as they warm and this increases atmospheric CO₂ levels. The CO₂ increases tend to lag behind warming periods by about 800 years. CO₂ is a tiny part of the greenhouse gases and the greenhouse effect (http://geocraft.com/WVFossil/ice_ages.html). The warming effect of CO₂ gets lost among other much larger natural climate drivers. Human emissions of CO₂ are even tinier (1 part per 100,000 parts of the atmosphere) and a human fingerprint causing warming is even more lost among natural influences. The human contribution to climate warming if it were statistically detectable would amount to nothing more than "a fart in a hurricane". Natural climate drivers with strong, clear correlations to warming/cooling periods include cosmic rays (see Henrik Svensmark's The Chilling Stars), solar flare cycles, related cloud cover, ocean current decadal oscillations (changing current patterns), earth's 100,000 year wobble, and others. CO₂ levels have been as high as 7,000 ppm in the past and no dangerous global warming occurred. During the Late Ordovician Period (some 400 million years ago) CO₂ levels were 4,400 ppm and Earth was as cold as it is now. Note also that Earth has been cooling since 2002 despite the fact that CO₂ emissions have been increasing. "There is no valid correlation between CO₂ emissions and global warming", concludes geophysicist Norm Kalmanovitch. Therefore, there is no scientific reason for us to worry about contributing to increasing CO₂ levels. We do not need

to reduce our carbon footprint We do not need to reduce CO₂ levels in the atmosphere or decarbonize our economies As the 31,000 plus scientists who signed the Protest Petition have stated, "There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth" (<http://www.petitionproject.org/>). To demonize carbon/CO₂, as environmentalists have done, is to demonize life itself This is ridiculous hysteria and entirely unscientific The only way to fully understand this anti-carbon movement is to recognize that it is ideologically driven extremism now gone utterly mad. Its real goal is to slow, halt, and even reverse economic growth and development and it uses carbon as a proxy to fight growth and the human enterprise But the Green movement in demonizing carbon has become anti-green, anti-life, and anti-nature Wendell Kross wkross@shaw.ca (4/9/09)

A Dear Wendell We appreciate your lengthy comment to the CDIAC Web site You raise several good points and one certainly questions your passion for the debate Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Nosotros necesitamos informacion en Costa Rica donde dirigirse a la entidad que este encargada para proyectos de bosques primarios para produccion de oxigeno y captacion de CO₂, ya que tenemos unos bosques con una area de 1'115.238 hectareas en bosque Cualquier informacion que pueda dñr suministrarnos por favor nos la dan a conocer. Atentamente LUIS ALFONSO ALVAREZ (4/8/09)

A Luis El carbón (como emisiones CO₂) para Costa Rica son encontrados en: <http://cdiacornl.gov/trends/emis/cos.html> Para conseguir los números el clic en "Datos Digitales" La primera columna es el año; la segunda columna es suma de los números en columnas 3-7. Los números en columnas 3 por 7 son: carbón (como CO₂) from combustibles gaseosos (columna 3), de combustibles líquidos (columna 4), de combustibles sólidos (columna 5), de estallar de gas natural (columna 6 – Costa Rica tiene ninguno de esto), y el carbón (como CO₂) emitido del cemento fabrica (columna 7). La columna 8 proporcionan las emisiones de carbón por persona La columna 9 (carbonera abastece de combustible) son combustibles utilizados en el comercio internacional Nosotros no tenemos ningún datos en la producción de oxígeno TJ Blasing & Jennifer Seiber

Q Hi, I work for a writer who's asked me to compile data on the top 10 polluting nations, their emissions now and also projection over the next several decades for each nation I was able to find the information for the top 10 nations on your site and through links that you provided However, I am experiencing difficulty finding projections/predictions for the next two decades Can you please provide me with some suggestions as to where this information might be available? Your assistance is truly appreciated Thank you. Victoria Kelly (4/8/09)

A Victoria I can answer your question for the United States Go to: http://www.eia.doe.gov/oiaf/aeo/supplement/suptab_30.xls And go to the 2nd-from-bottom line (Total). Units are million metric tons carbon dioxide Projections are through 2030, but they change every year, so be careful The numbers are quite citeable as Department of Energy projections For citation, google "Annual Energy Outlook" and "supplemental tables". These are "Reference Case" projections I am forwarding this to Gregg Marland who may be able to answer your question for other countries TJ Blasing

[from Gregg Marland] Victoria, this is a hard thing to find by country. The Intergovernmental Panel on Climate Change has done projections by world region, but not by country. To take a look at the regional projections go to www.ipcc.ch and look at their report on emissions scenarios Gregg

Q Hello, I seek a data set that will allow me to deduce the distribution of number of wet days in a year throughout the lower 48 states. Can you point me in the right direction? Regards, Daniel Rirdan (4/8/09)

A Daniel The raw data to determine this could be obtained from here: <http://cdiacornl.gov/epubs/ndp/ushcn/daily.html> (with data through 2005; soon to be updated through 2008) or here: <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/> with data through a month or so ago. But you want to calculate a climatology so the most recent year available would not be critical Sounds like a fun analysis Hope this helps Dale Kaiser CDIAC

Q if you replace one regular light bulb with a compact fluorescent light, how many pounds of carbon dioxide will you save per a year? (4/8/09)

A Dear Kayla The answer depends on the wattage of the light bulb and the source of electricity In general (U.S. average) about 1.5 lbs of CO₂ are emitted to the atmosphere for each kilowatt-hour delivered to your house If you replace a 60 Watt incandescent bulb (mainly produces heat) with an equivalent CFL (which mainly produces light), you save over 40 watts. If the bulb burns 1 hour a day for 25 days you have saved (40 hours X 25 watts) a kilowatt-hour, or about 1.5 lbs of carbon dioxide You can look at your electric bill to see how much you pay per kilowatt-hour; usually it's about a dime. However, when you calculate how many hours your light bulbs burn every night, and how many light bulbs your house has on, it adds up. Studying your electric bill can be a real educational experience Finally, a word of caution. CFLs contain mercury, so if you break one you need to know what to do. The following will link you to all you need to know. http://www.energystar.gov/ia/partners/promotions/change_light/

download\Fact_Sheet_Mercury.pdf We appreciate your question to the CDIAC Web site. Sincerely, T.J. Blasing

Q I will like to see a graph of CO₂ emission in UK (LATEST DATE AVAILABLE). If available, I will also like to see the breakdown by sources of emission. Thanks (4/7/09)

A The graph, through 2005, is at: <http://cdiac.ornl.gov/trends/emis/uki.html>. Preliminary estimates of total carbon emissions for 2006 and 2007 are 149763 and 144726, respectively. TJ Blasing

Q Dear Sir/Madam, I am a PhD student at Clemson University. I need some wind velocity profile for my research. Random data could be better, so any wind velocity profile related to any place or any time could be helpful. Would please help me how I can access the data. Best Regards, Arash Karimpour (4/6/09)

A Arash, The folks in the ORNL DAAC have asked me to help out with your data request. The largest source of vertical sounding data would be here: <http://www.ncdc.noaa.gov/oa/climate/igra/index.php?name=coverage>. Another easy place to get vertical wind profiles is from DOE's ARM website. Go to www.arm.gov, click on the "Measurements" tab, click on "atmospheric state", under upper air state, click on "horizontal wind". Click the "collapsed arrow" to expand/collapse the list next to "ARM Instruments" and you will see these various options: # Balloon-Borne Sounding System (SONDE) # Integrated Sounding System (ISS/SONDE) # Radar Wind Profiler (1290 MHz) (1290RWP) # Radar Wind Profiler (50 MHz) (50RWP) # Radar Wind Profiler (915 MHz) (915RWP). Such measurements would be available from the ARM "sites". Click on the Sites tab at www.arm.gov to learn more. Hope this helps. Dale Kaiser, CDIAC/ORNL

Q As all mammals exhale a percentage of carbon dioxide with each breath, has a possible correlation between atmospheric carbon dioxide levels and world population increases ever been investigated? i.e., does more people = more atmospheric carbon dioxide, and, if so, what are the data? (4/6/09)

A Dear Richard D. Stacy, We appreciate your question to the CDIAC Web site. Please see question no. 13 on our FAQ page for the correct way to think about this issue: <http://cdiac.ornl.gov/faq.html>. Sincerely, Dale Kaiser, CDIAC

Q I am trying to figure out how close the Earth's atmosphere is to being optically saturated (in the IR) with CO₂ at 380 ppm. That is, I would like to see a plot of the fraction of IR (leaving Earth's surface) escaping into space (say to 25 km) as a function of CO₂ concentration. I have read a number of papers that say that the absorption (greenhouse effect) depends logarithmically on CO₂ concentration. Why is this? I have no difficulty with mathematics. The more technical the better. I'm a physicist. I have John Houghton's book. I know about the HITRAN data files. Thanks a lot. Sam Werner. (4/5/09)

A Dear Sam Werner, The logarithmic part has to do with approaching optical saturation. 280 ppmv CO₂ keeps the earth about 11 degrees C warmer than it would be otherwise. The next 280 ppm (to double CO₂) would only warm us a few degrees. The calculation is made more difficult by feed-forward mechanisms. More CO₂ means more warmth which means more moisture in the air which means that the weak H₂O absorption bands in the solar spectrum will absorb more incoming light, and more outgoing heat will also be absorbed. Dew points will be higher (condensation will occur at higher temperatures) to keep the heat up, so to speak. This will all lead to a reduction in the percentage of earth covered with white stuff, so more sunlight will be absorbed at the surface, etc. An additional complication is that the upper atmosphere will undergo radiative cooling. Energy in = energy out, so the decrease of heat making its way upward "to space" from the lower layers of the atmosphere is compensated by a large temperature decrease and associated reductions in upward radiation from in the upper atmosphere. Identification of this increase is complicated by changes in the ozone layer and related thermal consequences. Finally, the earth's temperature would reach a new equilibrium in which heat radiated upward from the lower atmosphere would be increased due to a higher temperature. Etc. ... hope this helps. This is as brief an overview as I could compose of a subject which is now occupying several hundred scientists full-time. We appreciate your question to the CDIAC Web site. Sincerely, T.J. Blasing

Q To whom it may concern, A few months ago, I downloaded and used a lot of data from the NOAA file found by the web site http://cdiac.ornl.gov/epubs/ndp/usnc/state_AL_mon.html. The state I indicated above by the characters "AL" would be for Alabama, and other states would be found likewise. Now I'm trying to obtain precipitation from the same file. I'm wanting this data beginning in 1950 and going through 2006. When I click on precipitation and then scroll down to the section which says the data is available by month separated by commas and annual totals, I can get the data, but only one month on a line. Is it possible to obtain the data with all months for a year on one line. It will take a huge amount of paper to print this for very many locations if each month is on a separate line. I worked with a man from the AL climatological office, but neither he nor I were able to get it to display as the instructions seem to indicate. What are we doing wrong? Thanks for your help. Wayne Byerly Nixa, MO (4/3/09)

A Hi Wayne, You can get records containing the 12 months of the year and the annual total from our ftp area: http://cdiac.ornl.gov/ftp/usnc_monthly/. The precip file is `hcn_doe_pcp_data.Z`, which is a file that has been compressed via a unix command. Meant for more of the "power" user. The interface that you've described is meant more for the casual user. (I believe if you downloaded the .Z file, that the "winzip" utility would be able to unzip it.) If you tell me what you require in terms of states/stations, I can probably quickly make a file for you that will be easy to work with. We could see, anyway. Regards, Dale Kaiser

Q Your regional emissions data goes through 2004 (http://cdiac.ornl.gov/ftp/trends/CO2_emis/nam.dat). I am interested in data through 2008. Have you updated this product? Thank you. Cheers Jon (4/3/09)

A Dear Jon Hare, Our web site http://cdiac.ornl.gov/trends/emis/tre_coun.html now goes through 2005. Preliminary estimates for 2006 and 2007 are available at: http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2006_2007.xls
We appreciate your question to the CDIAC Web site. Sincerely, T. J. Blasing

Q Dear Sirs and Madams, It's my pleasure to visit CDIAC website. I really learnt a lot from here. In fact, we are doing a school assignment about the Forest Decrease in Africa and I found a photo link (<http://cdiac.ornl.gov/ftp/ndp055/pctforest.gif>), it is useful for our report. Would you please teach us when the photo was shot, 1980? We would like to submit the before and after photo to show the decrease forest area in Africa to teach our classmate how different it is. We will list the photo excerpt in our report. Thank you kindly for assistance and looking forward to. (4/2/09)

A Dear Alvan Hsu, We appreciate your question to the CDIAC Web site. The graphic map you mention in your email was generated using data representing conditions in 1980. Please cite the graphics as follows in your report: Percent Forested Land in 1980, taken from: Brown, S., and Greg Gaston. 1996. Tropical Africa: Land Use, Biomass, and Carbon Estimates for 1980. NDP-055, Carbon Dioxide Information Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Sincerely, Lisa Olsen
CDIAC

Q How much CO₂ does one human produce in a day? How do they produce this much and what metabolic processes does the majority come from? (4/2/09)

A Sarah, CO₂ is produced during respiration. The average adult expires 216 kilograms of CO₂ per year, or 0.6 kg CO₂ per day. This estimate differs based on age, gender, and physical exercise. Please see attached paper for more information. Thank you,
Tris West

Q Hello my name is Katerina. I am doing a global warming project for my school. And I have a few questions about global warming to ask you. 1) Is there any way to completely stop global warming? If yes how? 2) How will global warming affect our economy? 3) If all the sea ice in Antarctica melted what would happen? 4) Could global warming benefit any species? 5) I heard that there are some scientists who like global warming. Is this true? 6) Could global warming be cancelled out by some natural change in the earth such as an ice age? If you could answer these questions I would be very happy. (and so would my teacher) Thank you (4/1/09)

A Hi Katerina, I just wanted to let you know that we've read your email. While I won't be trying to give you all the answers to your project (after all, it's a research project, right?), I will be able to make a few comments and point you to some sources that will give you lots of good information to analyze. I'm on travel right now, but will likely be able to email again w/in the next few days. For starters, I will point you to one good, understandable expert source that has recently become available: <http://dels.nas.edu/climatechange/basics.shtml> Dale Kaiser CDIAC

Q > Question > Hello my name is Katerina. I am doing a global warming project for my > school. And I have a few questions about global warming to ask you. > > > 1) Is there any way to completely stop global warming? If yes how? > 2) How will global warming affect our economy? > 3) If all the sea ice in Antarctica melted what would happen? > 4) Could global warming benefit any species? > 5) I heard that there are some scientists who like global warming. Is > this true? 6) Could global warming be cancelled out by some natural > change in the earth such as an ice age? > > If you could answer these questions I would be very happy. (and so would > my teacher) Thank you (3/31/09)

A Okay, Katerina, back to your questions. Again, I will give you a few pointers and sources. 1) Is there any way to completely stop global warming? If yes how? If you mean man-made global warming through emissions of greenhouse gases (mainly CO₂ from fossil fuel combustion and land clearing, the man-made effect could only be "shut down" by not emitting any more CO₂ than the amount that would keep atmospheric concentrations steady. Also, look through these: <http://cdiac.ornl.gov/faq.html> 2) How will global warming affect our economy? So complex. Depends on policy and actions. A few suggestions: <http://tonto.eia.doe.gov/ask/faq.asp> http://www.pewclimate.org/global-warming-basics/climate_change_101 3) If all the sea ice in Antarctica melted what would happen? Various estimates of sea level rise have been made. See things at: http://www.pewclimate.org/global-warming-basics/climate_change_101 [http://www.eoearth.org/article/Climate_Change_\(collection\)](http://www.eoearth.org/article/Climate_Change_(collection)) 4) Could global warming benefit any species? Probably, but negatives are thought to outweigh positives. See: <http://www.nwf.org/wildlifeandglobalwarming/effectsonwildlifefcm> <http://news.stanford.edu/pr/03/root18.html> 5) I heard that there are some scientists who like global warming. Is > this true? Yes, although calling most of them real "scientists" is a stretch. Here is one of the many skeptic websites: <http://www.worldclimaterreport.com/> Folks like this used to say that warming was not taking place. Now they say it is, but it's not a problem. Many have had their "research" funded by the fossil fuels industry. Most people consider the most reliable analysis of global change to be that by the 1000s of scientists comprising the IPCC: <http://www.ipcc.ch/> 6) Could global warming be cancelled out by some natural > change in the earth such as an ice age? Yes, if natural changes acted fast enough, but things are thought to

take place slowly and infrequently compared to the human-related changes we think are taking place now. See for example the link I sent before <http://dels.nas.edu/climatechange/basics.shtml> Also, see: www.climate-science.gov and look for the "Climate Literacy" guide. Good luck with your work. Glad you're becoming an informed citizen. Dale Kaiser CDIAC On Wednesday 01 April 2009 10:40 am, you wrote > Hi Dale, >> Thank you so much for your responses so quickly! I am so excited and can't > wait to hear back from you. Enjoy your travel and thanks again! >> From, > Katerina >> _____
> From: Kaiser, Dale Patrick

[kaiserdp@ornl.gov] > Sent: Wednesday, April 01, 2009 10:29 AM > To: Mayberry, Shannon > Cc: Boden, Thomas A.; Baes, Fred; Kaiser, Dale Patrick > Subject: RE: Questions submitted to the CDIAC Web Site >> Hi Katerina >> I just wanted to let you know that we've read your email. While I won't be > trying to give you all the answers to your project (after all, it's a > research project right?), I will be able to make a few comments and point > you to some sources that will give you lots of good information to analyze > I'm on travel right now, but will likely be able to email again w/in the > next few days >> For starters, I will point you to one good, understandable expert source > that has recently become available >> <http://dels.nas.edu/climatechange/basics.shtml> >> Dale Kaiser > CDIAC

Q I have tried several times to enter a question and put in the code. It gets rejected each time. Last try (3/31/09)

A Dear Mark, We appreciate your comments & feedback on the CDIAC Web site. Still experiencing any difficulties with our web site and/or your browser in submitting questions and comments? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am a retired chemical engineer I used to do research on chemical systems and computer modeling of various processes to make different materials. I was taught that any model to be credible must be calibrated with reproducible data and you had better be very careful if you extrapolate. My question is—has anyone ever conducted laboratory experiments to generate data on the absorption of infrared radiation by CO₂ in air and the resulting temperature rise? I would expect studies to be made varying the CO₂ levels from 0 to 1000 ppm? (3/31/09)

A Dear Mark Hannah, Probably the paper which (a) I can find quickly on the internet and (b) of interest to you would be found at: <http://www.springerlink.com/content/k8q35863543546w8/> The absorption coefficients are well known for a wide variety of temperatures and pressures, but there is still some error term. This is reasonably summarized in terms of climate effect at the top of the troposphere in Figure SPM 2 of the IPCC report at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf We appreciate your question to the CDIAC Web site. Sincerely, T. J. Blasing

Q Is it true that the Vostok ice core data demonstrates historical temperature rises have preceded rises in atmospheric carbon dioxide by hundreds of years? (3/30/09)

A Michael, The best concise discussion of this question that I've seen is in a recent National Academies report <http://americasclimatechoices.org/basics.shtml>....see page 10 of this pub. The linkage of CO₂ and temperature over the millennia is a little bit different animal than over the past 100-200 years. Hope the above helps. I consider it expert and authoritative. Regards, Dale Kaiser

Q If the figures on page: <http://cdiac.ornl.gov/trends/emis/top2005.cap> are in tonnes of carbon per capita, then labelling them CO₂_CAP is misleading. I presume they really are carbon and CO₂ per cap is got by multiplying by 48/12? (3/29/09)

A Dear Geoff, Our per capita emission estimates are expressed in carbon, not CO₂. To convert, multiply by 3.667 (44/12). Sorry for the confusion on the labelling. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q This question deals with total CO₂ emissions by country. How hard would it be to calculate emissions from land use, animals and people for each country going back to 1800, or even just from the year 2000. It seems that this data is biased towards industrial emissions, whereas if we are concerned with CO₂ emissions then regardless of whether they are emitted from farm animals (because we eat too much meat), people (due to over population) or because we cut down forests (land use) to use for people and animals, it should not matter. After all CO₂ is CO₂. Meaning China was a major emitter of CO₂ back in 1800 due to the size of its population and land animals, and still is today. (3/27/09)

A Dear Stephen, We appreciate your question and comment to the CDIAC website. You are correct in your statement regarding the importance of CO₂ emissions from land-use, human respiration, and livestock. The problem often is data availability or lack thereof and the methodology used to generate the emission estimates. Securing good country-level data often impedes efforts to quantify emission sources at national and sub-national scales. In the case of land-use emissions, you also need to know what happens to the forest when you cut it down (i.e., is the tree left to rot on the ground where it decays relatively quickly or is it used to produce wood products where it might be stored for considerable periods). You can find some of the emission estimates at the following URLs: <http://cdiac.ornl.gov/trends/landuse/houghton/houghton.html> <http://cdiac.ornl.gov/carbonmanagement/>

Q I'm preparing charts for a book on energy for Girl Scouts, and I'm trying to figure out some data discrepancies. We prepared a chart on rise in CO₂ emissions over time based on the Oak Ridge data for 1751-2005, which has the 2005 emissions (from fossil fuel burning, cement manufacture, and gas flaring) at 7,985 metric tons. We did a second chart comparing emissions from different countries in 2006. The numbers don't match up. The latest figures on the US gov't EIA site give the 2006 figure for total world CO₂ emissions (from consumption and flaring of fossil fuels) to be 29,195.42 million metric tons. Why is it more than 3 times the other figure? Hope someone can help as the book is at the printer! (3/25/09)

A Dear Sarah Micklem, We appreciate your question to the CDIAC Web site. Please see our FAQ page at <http://cdiac.ornl.gov/faq.html> ... specifically question 9 for your answer! Please don't hesitate to contact cdiac again with any other questions on this or other global change subjects. Thanks for doing such a great job educating young people about global change issues. Sincerely, Dale Kaiser CDIAC kaiserdp@ornl.gov

Q > Hello Mr. Kaiser, >> Thank you for your reply. However, I still would like to know if CO₂ is the > driver for global temperature change, or is it the output of energy from > solar sunspots, flares, ejections of energy so massive that our electric > supply grid is overwhelmed and shut down. Currently, the solar cycle of > sunspots is at an unprecedented two year low. During the Maunder Minimum > six hundred years ago, this lasted for decades and caused the Little Ice > Age. Two thousand years ago, at the time of Jesus, and the peak of Roman > power, the global temperatures were warmer than today. I just do not > believe that CO₂ @ .000385 parts per million in the atmosphere is bad, when > historical CO₂ has been much higher, and lower, and nobody knows how much > effect CO₂ has on global temperatures compared to water vapor, methane > ozone layer, solar fluctuations, orbital changes, ocean currents, volcanic > eruptions, land mass at Earth's poles that prevent ocean water from melting > the ice caps, etc. > > How much heat does the burning of fuel create? The exhaust of internal > combustion engines is 600 degrees or more. Jet engines are thousands of > degrees. Nuclear explosions create so much heat that I do not know how to > describe it. >> Do oil slicks on oceans and lakes prevent absorption of CO₂ into the water? >> Does the higher level of CO₂ help plants grow better? >> Do vapor trails of aircraft affect temperatures? >>>> There are so many things to consider, I just do not understand the concern > over CO₂. >>>> However, I am for preventing carcinogens, carbon monoxide, trash, and > pollutants in general. >> I am for education of proper use of fertilizers to help plants grow. >> I am for use of photovoltaic and wind driven electricity. >>>> Thanks >> Douglas Starr (3/24/09)

A Hi Douglas, Yes, the climate system is incredibly complex. The bottom line manifestation resulting from human activity (massive release of CO₂ from burning of fossil fuels and land-use change) is an earth-atmosphere-ocean system that is out of radiative balance. Please see: http://www.nasa.gov/vision/earth/environment/earth_energy.html and www.scienceonline.org/cgi/reprint/308/5727/1431.pdf Dale Kaiser

Q Dear Greg, >> Is there a way that you know of to convert CDIAC's .ems files to excel? >> Hope all is well with you. >> All the best. >> Idrian (3/24/09)

A Hi Idrian, Gregg Marland has asked for advice on this, and I'm glad to give it. If I understand correctly, you are referring to a file such as the one here perhaps: http://cdiac.ornl.gov/ftp/ndp030/global.1751_2005.ems. In your web browser, if you click on "file", then "save as" or "save page as", then tell it where you want the file, it will save it there. If you are using the IE browser, you should probably tell it you want it saved as a "text file" in the "save as type" drop down menu. Once you save it, you can open it with Excel. It will probably ask you about the original data type. It will probably have "delimited" chosen - just keep that and click "finish". You'll just need to clean up the header/title information if you want to keep it in the file. In addition, note that the Per Capita column doesn't have values until 1950, so you may need to do some editing of previous years (setting to "0", or whatever). This advice should get you close! Regards, Dale Kaiser CDIAC

Q do you have the data from "Global, Regional, and National Annual CO₂ Emissions from Fossil-Fuel Burning, Cement Production, and Gas Flaring, 1751-2000" available in excel format? (3/24/09)

A Anthony, we just a few minutes ago answered essentially the same question for another data user. I will forward the answer to you separately. If there are remaining questions, let me know. Gregg

Q We are studying the data on USA carbon emission by state for 1960-2001 from your site. 1. Please direct us to or provide us with the same kind data for 2002-2008, if that is available to the general public for study. 2. Please help us understand how those data (coal, oil, gas, etc.) were derived from other sources such as the EIA annual report on greenhouse gas. Thank you, C. Sung (3/24/09)

A Hi: EPA has taken over the function of keeping track of the state data, and they only have gotten up through 2005 so far, as these things take a couple of years. Their data, and some leads to their methodology can be found at: http://www.epa.gov/climatechange/emissions/state_energyCC2inv.html. The EPA site only goes back to 1990, but they do things pretty much the same way we do and get very close to what we got, so we often use ours and theirs as "consistent" time series. For a description of what

we did and how our results compare to EPA's, I have attached a paper we wrote on the subject TJ Blasing

Q > The temperature of the earth has been determined by oxygen isotopes. The > CO₂ levels have been determined by various methods >> Question: does the level of CO₂ precede or lag or coincide with the > temperature over millions of years? (3/24/09)

A Dear Yvette, You have an excellent question on an issue that over the years has been used a bit "freely", mainly by warming skeptics who not long ago said that today's temperature variations drive CO₂ variations (rather than the other way around). Over hundreds of thousands of years, experts describe CO₂ mainly acting as a feedback mechanism on natural temperature changes, thus reinforcing temperature changes brought about by long cycles related to earth's orbital changes. However, over the past few hundred years, dramatically increasing CO₂ concentrations as a result of fossil fuel combustion and land-use change are acting like a forcing, not a feedback. Please see this National Academies report for a great illustration of this and other questions: <http://americasclimatechoice.org/basics.shtml> Dale Kaiser CDIAC

Q Does CDIAC still publish a newsletter? I noticed on the website that there are only newsletters available to 2003. I work for a climate change campaign and am looking for up-to-date information about U.S. CO₂ emissions. Thank you. (3/19/09)

A Dear May Boeve, We appreciate your question to the CDIAC Web site. We have gone to a "virtual" newsletter, available via a link from the same page you probably viewed: <http://cdiacornl.gov/newsletter.html>. We no longer print hard copies. The virtual newsletter does have some post-2003 information, but the best way to keep up with things is our "What's New" page at <http://cdiacornl.gov/whatsnew.html>. Regarding U.S. CO₂ emissions, perhaps you have visited http://cdiacornl.gov/trends/emis/tre_usa.html. This record extends through 2005. There is always a lag between the last calendar year and the last year of the record available at on our "Trends" pages because of the time and complexity involved in the reporting of data from individual countries and the quality assurance efforts that go into producing this database. However, our experts have been involved in work that gives some information beyond 2005, (e.g., a journal article about China taking over 1st place in country emissions: <http://www.agu.org/pubs/crossref/2008/2007GL032887.shtml>). I have copied some of those experts on this email so that they can share any other official updated information and/or tell you when our online emissions database will be updated next. Regards, Dale Kaiser
Question: Does CDIAC still publish a newsletter? I noticed on the website that there are only newsletters available to 2003. I work for a climate change campaign and am looking for up-to-date information about U.S. CO₂ emissions. Thank you.

Q explain how oxygen, carbon dioxide, and other wastes are exchanged in the lungs and body tissue? (3/19/09)

A Dear Natalie Snider, <http://www.merck.com/mmh/sec04/ch038/ch038d.html> is a good website explaining this. We appreciate your question to the CDIAC Web site. Sincerely,

Q Thanks all for your timely response to my question. I just spent a bit of time on the ORNL website and found a great deal of useful information. Looking at your website got me thinking—my organization, 350.org, is planning an international day of events all over the world to highlight the importance of heeding the latest climate science. Specifically, we hope to influence the outcome of the United Nations meetings in Copenhagen this December. "350" stands for ppm Carbon Dioxide, and is taken from the latest research from Dr. James Hansen, at NASA. We will coordinate hundreds of events all over the world—at each event, participants will take a photo that somehow depicts the number 350. You can see some examples on our website. Do you think scientists and researchers at Oak Ridge would be interested in participating? The date is October 24, 2009. Thanks! I understand that this may be an unusual request. Take care, May Boeve (3/19/09)

A Dear May, We appreciate your e-mail to the CDIAC website. I am pleased you found our website useful. Please send us more information about the upcoming October event. What is the significance of 350 ppm? Present background atmospheric levels are well above 350 ppm. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I read the FAQ section on your site regarding CO₂ emissions. You state that the burning of fossil fuels adds CO₂ to the atmosphere. Fossil fuels are CO₂ sinks; are they not? Created when CO₂ was extracted from earth's atmosphere? Burning these fuels returns the CO₂ to where it was in the first place. The earth seemed to be a very warm and hospitable place according to the fossil record for this "Carboniferous" period when CO₂ was extracted out of the atmosphere and sunk into coal deposits throughout the earth. Given that the plants that gave rise to the coal depended upon the sun to grow, one can also conclude that burning fossil fuels is in fact a use of "solar" power that has been "banked" for millennia. Please balance your site with all of the facts. I for one would rather we had a warming earth than a cooling earth. Glaciers covered my part of the USA just 20,000 years ago. If humanity can indeed be faulted for warming the planet, then fault us to our benefit. A warming planet has brought more life to human kind than a cooling planet has ever done. The fossil record of mass extinctions indicates that the cause was global cooling and glaciation... this according to paleoclimatologists and geologists (3/18/09)

A Dear Bob, Thanks for your comment to the CDIAC web site. We do try to state the facts in a balanced way. To my knowledge, our web site does not state the observed warming trend over the modern instrumental record is due to elevated levels of greenhouse gases in the atmosphere. We provide all these records (long-term temperature records, long-term atmospheric CO₂ records, long-term fossil fuel emission records) just as we provide the available vegetation response data to elevated CO₂, which by

the way, shows increased productivity water use efficiency, increased root production, etc - not all bad. I agree completely there is still uncertainty surrounding a greenhouse gas induced climate change and there are numerous aspects where our understanding is inadequate (e.g., aerosol feedbacks). Over time these issues will be resolved and our understanding of biogeochemistry plant physiology atmospheric transport etc. will continue to improve under the umbrella of "climate change". Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | How is carbon dioxide concentration measured in ice cores? (3/15/09)

A | Dear Sophie, Thanks for your question to the CDIAC Web site. Ice core samples are handled with amazing care and under sterile conditions in the laboratory. The ice samples are cut and then crushed under vacuum to release the trapped air bubbles. The air bubbles are then fed, after cryogenic drying, to an infrared gas analyzer which can make CO₂ determinations to an accuracy of +/- 0.1 part per million. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | a) How much energy is radiated by the earth in the 3.3 to 3.4 micron wavelength range? b) How much of this is absorbed and reradiated downward by the existing carbon dioxide in the atmosphere? c) Would a further increase in atmospheric CO₂ further increase the earth's surface temperature? (3/13/09)

A | Dear Tom Starr, We appreciate your question to the CDIAC Web site. First, regarding your question "c": would further atmospheric CO₂ increases warm the planet further. Yes, this is expected to happen. The exact magnitude cannot be stated with complete certainty, but a range quoted by the IPCC is from about 1C up to around 5C by the end of the century. See <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> ...summary for policy makers section or more detailed sections. CO₂ emissions have recently been increasing even more than expected and the various predictions/scenarios are related to future CO₂ concentrations in the atmosphere. Right now, changing atmospheric composition means more heat being retained in the earth-atmosphere-ocean system (a lot in the oceans). For an authoritative discussion of this, see: http://www.nasa.gov/vision/earth/environment/earth_energy.html. If we kept CO₂ constant the earth would in time reach radiative balance again, but CO₂ concentrations are continually rising therefore this results in a "forcing" that serves to lead to a building imbalance. Regarding your questions (a) and (b), I don't have numbers readily available to give you, nor would I consider myself an expert in atmospheric radiative transfer. I'd have to do some review of my radiation texts to come up with ballpark calculations. I would start with the latest IPCC Report <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> (see chapter 2 and its associated references). I hope this response is of some help. Sincerely, Dale Kaiser
CDIAC

Q | How can we suggest practical mitigation measures for climate change occurring globally especially due to GHGs (3/13/09)

A | Dear Shukti Tomar, Perhaps point out the monetary savings. The March Issue of National Geographic Magazine has a nice article about how you can save money and reduce carbon emissions at the same time. I will try to find some tutorial material on this, which may help you convince people. Sincerely, T. J. Blasing

Q | > Do you know a test service or lab which could work with us to determine the > carbon foot print of a siding product which is a composite of Cenosphere > fiberglass and MDI resin? (3/12/09)

A | Paul, I'm afraid we don't know someone specifically to recommend for this task. Of course a lot of people also are interested in the carbon footprint idea, so I assume you've found and visited a bunch of websites related to taking inventory of energy use throughout typical processes and behaviors. Smart Googling is all I'd also be able to do with regard to this. In many cases the biggest carbon emission factor would be the amount of electricity used and the means by which the electricity was produced (mostly coal-fired power plants). A lot of good information can be gleaned from: <http://www.eia.doe.gov/> and also you might check out CDIAC's FAQ page: <http://cdiacornl.gov/faq.html> including Q.No. 17. Good luck, Dale Kaiser
CDIAC

Q | Where is water vapor on your GHG table? Water vapor accounts for 90-95% of the GHG effect. By omitting water vapor from your table of GHG concentrations you are being misleading and fraudulent. Your validation code scheme invites error. Most people will miss the note about the third character. Others will be confused by it. Should I leave out the third character, or replace it with a blank (3/11/09)

A | Dear Paul, Thank you for your comment to the CDIAC Web site. Your point is well taken regarding the importance of water vapor as a GHG and our omission of water vapor from our greenhouse gas table. Water vapor is the premier greenhouse gas and we should state why we omit water vapor from the table (i.e., there is no citable background tropospheric concentration level because it is so reactive, so variable, etc.) CDIAC certainly recognizes the importance of the gas as evidenced by our water vapor holdings (e.g., the AmeriFlux archive provides millions of 30 min water vapor flux and concentration estimates from ~ 100 sites throughout North America). I am sorry but I did not follow your comment regarding the "validation coding scheme" and the third character. Please elaborate so I may address your comment adequately. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@aol.com

Q | Pleas tell me why the CO₂ emissions of Australia reduces at 1998. What are your sources to get that data. I am asking this question the 2nd time, please (3/11/09)

A | All of our estimates of CO₂ emissions are based on energy data from the United Nations Statistical Office. We do extensive quality assurance/quality control checks on the UN data but ultimately we are constrained by data reported by the countries and compiled by the UN. Gregg

Q | Carbon dioxide absorbs at fairly specific wavelengths at what wavelengths does it radiate back heat? (3/11/09)

A | Dear Colin Henderson, We appreciate your question to the CDIAC Web site. While atmospheric radiation is not my specialty I hope it will be a little bit helpful to address your question using a reply to a user who recently had a similar question. In addition to that, I feel fairly confident that CO₂ does not re-radiate infrared radiation at a significantly different wavelength than it was absorbed at. Also, you might be interested in chapter 2 of the most recent IPCC report: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> Please see below for the answer provided the other user recently. Regards, Dale Kaiser CDIAC

----- The radiation you speak of is already "heat" radiation because the frequencies of radiation absorbed by CO₂ are in the infrared (heat) portion of the spectrum. Here is a link to a good graphical representation of what wavelengths of radiation are affected by which gases: http://www.udel.edu/Geography/DeLiberty/Geog474/geog474_energy_interact.html The whole page is quite instructive but scroll down to "Atmospheric Absorption and Transmission". Other versions of such a graph (a hard copy in a text I have) are a little clearer (plotting absorption rather than transmission), but the basics for CO₂ are absorption peaks at a little less than 3, a little more than 4, and at about 15 microns. The 15-micron point is especially apparent in the graph I've pointed to; i.e., CO₂ has an atmospheric transmission of zero at that wavelength (note the scale is not perfectly linear). To help understand the graph better, we often speak of a major "atmospheric window" at about 12 microns. At that frequency of radiation, very little is not transmitted by the atmosphere. Thus the peak in transmission on the graph. Now, why is more CO₂ important over time? It's basically a "question of balance". Right now, changing atmospheric composition means more heat being retained in the earth-atmosphere-ocean system (a lot in the oceans). For an authoritative discussion of this, see: http://www.nasa.gov/vision/earth/environment/earth_energy.html If we kept CO₂ constant the earth would in time reach radiative balance again, but CO₂ concentrations are continually rising therefore this results in a "forcing" that serves to lead to a building imbalance. Question: Can you tell what are the exact frequencies of radiation that are trapped by carbon dioxide and converted to heat. Also, is it correct to say that substantially ALL radiation of those frequencies gets trapped and converted to heat at current levels of carbon dioxide?

Q | I am trying to retrieve carbon dioxide data from the Mauna Loa, Hawaii and can only find data as far back as 2003. Can you help me (3/11/09)

A | Dear Cheryl Ward, We appreciate your question to the CDIAC Web site. Please see this link, and click on table entries for Mauna Loa: <http://cdiac.ornl.gov/trends/CO2/sio-keel.html> Please contact me if you have further questions about CDIAC's web site and datasets. Sincerely, Dale Kaiser CDIAC

Q | Hello, I would like to find the country specific data for the CO₂ emissions per kWh produced. Can you help me finding this information for the last year? Thank you for your attention and your help (3/10/09)

A | Dear Romain, About 1.5 lbs of carbon are produced per kilowatt hour of electricity DELIVERED to your house if you are an average U.S. citizen. I have no information for other countries but it would depend on their resources (coal, oil, gas, hydropower) and whether they have nuclear generating facilities. Less carbon dioxide is produced per kWh GENERATED. Some electrical energy is lost in transmission or is bled off to run the power plant. Therefore it takes more than one kWh generated to get a kWh through to your house. Sincerely, T.J. Blasing

Q | Why is carbon dioxide a gas? (3/10/09)

A | Dear Rhianon Freed, We appreciate your question to the CDIAC Web site. Like other molecules, CO₂ has temperatures at which it changes state from solid to liquid to gas. It just turns out that at normal atmospheric pressure, CO₂ gas will change to a solid at -78C. See: <http://www.ilpi.com/msds/ref/carbondioxide.html> Sincerely, CDIAC

Q | What has been the percent increase in CO₂ in the atmosphere over the past years? (3/9/09)

A | Stephen, There are many locations and time frames for which this calculation could be made. See <http://cdiac.ornl.gov/trends/CO2/content.html> for a listing of data sources for many times and locations. For the most recent time period, the data from Mauna Loa have been used extensively for this type of calculation. That data can be found at <http://cdiac.ornl.gov/ftp/trends/CO2/maunaloaCO2> and contains monthly and annual data for 1958 to 2007. An example calculation that may answer your question is what is the percentage increase from 1960 to 2007 on an annual basis at Mauna Loa? Using data from that URL would give $100 * (383.55 - 316.91) / 316.91 = 21.375\%$. I hope this is of help. Sincerely, Robert Andres

Q To: bodenta@ornl.gov Cc: blasingtj@ornl.gov, gum@ornl.gov Dear Tom, You really anticipated all possible cases. With the knowledge of the link ".../top2005.tot", I could have saved much time! The other hint with ".../meth_reg.html" is also useful. Many thanks! PS: Do you work also on Sunday? Sincerely Koji Environmental Consultancy <http://www.mochizuki.de> (3/8/09)

A Dear Mochizuki, Thanks. I am pleased we were able to point you to the right data products and save you time and effort. It looks like we both work too much including Sundays. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q Dear Gregg, I've got an idea for a small improvement as under. I used your table National CO₂ Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring, 1751-2005, August 27, 2008. Source: Gregg Marland, Tom Boden, Robert J. Andres Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory in order to calculate CO₂ emissions of many countries. Of course, I took the newest data from the year 2005. The table begins, however, with the year 1751, so that I had to scroll the screen content to the year 2005 every time. The scrolling was boring and was a waste of time. For the next revision of the table, could you begin the table with the newest year and end it with the year 1751 for each country? This will help avoid a waste of time, since most of people would be interested for the newest data! Thank you for your attention! Sincerely Koji Email kmochi3@gmx.net Tel: +49-221-373387 and +49-221-3404149 Post: Engineering Office Koji Mochizuki Martin-Luther-Platz 13 D-50677 Cologne GERAMNY (3/7/09)

A Dear Koji, We anticipated users like you wanting only the latest national fossil-fuel CO₂ emission estimates. The data presented at <http://cdiac.ornl.gov/trends/emis/top2005.tot> provide the latest estimate for all countries of the world in descending order. Sorry you had to sift through all the countries in our time series files. A better entry point in the future to our emissions work may be http://cdiac.ornl.gov/trends/emis/meth_reg.html. We have lots of products tailored to different needs and starting here may help you find the product you need for a particular application. Thanks for your comment. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q The ice-core data from Vostok have entries at the 5th and 6th position in reversed direction (starting from bottom) that show different CO₂ values but identical values for the other three entities. How comes? <http://cdiac.esd.ornl.gov/trends/CO2/vostok.html> Best, Hans Diebner (3/6/09)

A Dear Hans, Thanks for your question to our web site. These are two different air samples or aliquots taken from the same ice sample and measured separately on the infrared gas analyzer. The result is two different CO₂ determinations from two separate air samples taken from the same ice sample at the same depth. Efforts are made to make multiple measurements at each level but this often is not possible due to possible contamination during air extraction, etc. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q I am an undergraduate doing a research paper for a Public Policy class on whether a carbon tax or a cap-and-trade system would work better. Some crucial information I need is the amount that carbon emissions should be reduced to counter the effects of global warming. What I need is a non-arbitrary target for how much less the world needs to produce. Any help, or places to look for this information, would be most appreciated. (3/6/09)

A The European Community has taken the position that we need to avoid the temperature increasing by an average of 2 degrees C. This, of course, is a bit arbitrary too, but people have argued for years what a "safe" level of atmospheric CO₂ means. I suggest starting by going to the IPCC web site and browsing their reports - in particular the mitigation volume of the Fourth Assessment Report. You should find some "emissions paths" for stabilization scenarios, i.e. what path do emissions have to follow in order to stabilize the atmospheric concentration at different levels of atmospheric concentration (www.ipcc.ch). The emissions paths show how the rate of increase of emissions has to change until ultimately emissions are decreasing. Fun exercise, have fun with it, Gregg

Q Why does http://cdiac.ornl.gov/ftp/trends/CO2_emis/ocn.dat give negative CO₂ emissions in the 1850s? Also is the large jump in CO₂ emission in North America at 1800 correct? (3/5/09)

A Clearly, negative numbers are not possible and the big jump for North America in 1800 seems unlikely. But there are a couple of ways that you can actually end up with negative numbers and they all serve to remind us of the inherent uncertainties and idiosyncrasies in these kinds of data sets. Emissions are estimated from the best available data on fossil fuel consumption. And we do not have fossil fuel consumption for most of this time series so it is really "apparent consumption". Apparent consumption is production + imports - exports - increases in stocks - fuel used for international bunker fuels. And all of these numbers are subject to some uncertainty. The easiest way to end up with a negative value is for a country that has large production plus large exports, so with a minor error in either you can end up with exports greater than production. Ok, I agree that it does not make sense for a statistician trying to make sense each year, but it happens. You can get negative values for one fuel if, for example, a country produces coal, converts it to a liquid or gaseous fuel, and exports the liquid or gaseous product. In this case we would end up with negative values for the liquid or gas and exaggerated values for the solid fuel, but the national total ought to be ok. We have more or less consistent data sets from the UN for all years beginning in 1950. Prior to 1950 we have tried to assemble coherent data sets from a variety of sources, but there is often no way to sort out some of these idiosyncrasies. Things like the 1800 step surely reflect a change in data source. The bottom line, really, is that you need to have sensitivity to the inherent uncertainty in the numbers and to not put too much trust in absolute values, especially in the earlier part of the time series. Hopefully the basic magnitudes, relative magnitudes, and trends are accurately captured. I did not go back to the raw data you pointed to, but we can if you would like.

Hopefully this will give some insight on what you (and we) are up against. Gregg

Q Hello I am working on a project for the company I am employed by in the Health care supplier sector. We would like to produce some giveaways for exhibition that are relevant to our customers. I would like to give away plant seeds to produce a plant that will offset their carbon emissions, say from their computer. Do you have any values at all on the CO₂ absorbed by any indoor plant in a pot vs the carbon output of a computer? I have tried to search all over websites and can't find anything. Your help would be greatly appreciated as I have to present to our UK Board of Directors on 26th March and need all I can to justify the continuation of this project. Many thanks Karen (3/5/09)

A It's not surprising you've not found answers/parameterizations. That's a tough one, at least the CO₂ absorption side of the question. But, I can at least point you to half the answer, related to electricity use by household appliances (and the amount of CO₂ produced assuming that it was produced via a coal-fired power plant - the most common type). Take a look at FAQ 17 from this page: <http://cdiac.ornl.gov/faq.html>. Certainly every plant is good, but I'm afraid that something the scale of one good-sized houseplant can't do much to offset emissions from the electricity used by something like a fridge, or probably even a computer. Sorry to be the bearer of bad news on this "problem of scales". Here is also a response from our most expert person in these parts to a larger-scale question a user had in the past: "In the light of current interest in carbon footprints, carbon offsets, and the possibility of living a carbon neutral life, yours is indeed an intriguing question. For most of us individual citizens, our only direct emissions of CO₂ are probably from our car - unless we happen to have a gas heater, gas water heater, or gas stove. But we should probably also count our share of emissions from our electricity consumption and our share of the fuel in our bus, train, or airplane. And then there is our share of the fuel for the police car on the beat, for street maintenance for the emergency room at the hospital, and for the lights at the mall. There is also our share of the freezer at the grocery store, the truck that brings us our vegetables, and the factory that sews our shirts. By the time we are done, the average per capita emissions in the US are about 5.5 metric tons of C per year. Now about that tree. Trees, like us, breathe in and breathe out. They also provide food for birds and bugs, etc. So the only carbon that really offsets our fossil-fuel-based emissions is to the extent that the tree is actually bigger at the end of the year than it was at the beginning. So how many trees do we need before the annual increase in mass amounts to 5.5 tons of carbon? (Note that a tree is about half water and half of the rest is carbon, so we need the trees to gain about 4 times 5.5 tons per year, or about 22 tons per year). With fast-growing plantation trees, we can take up perhaps 7 tons of carbon per year - per hectare. So we need about $5.5/7 = 0.78$ hectares of fast-growing plantation trees (about 2 acres of trees) per person. Every tree counts, of course, so keep planting! But full carbon neutrality takes a lot of trees. In view of the fact that folks are out there now selling carbon offsets that seem fairly cheap, notice that the first folks who buy offsets are going to get the cheapest ones (the fastest growing trees, if you wish). When we get out there a ways it is going to get tougher (and more expensive), and there is not enough land in the US to plant enough trees for all of us." Dale Kaiser CDIAc

Q Excellent site. (3/4/09)

A Dear Julie, We are very pleased you found the CDIAc Web site useful. There are lots of new and exciting data on the horizon including an abundance of ocean pCO₂ and pH measurements, updates to fossil fuel carbon releases, etc. I hope you'll visit our site again soon. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Can you give a rough estimate of how much is the emitted carbon in melting used polyethylene bags? (3/4/09)

A Vivian, I am not aware that this estimate has been published. Basically it depends on how much energy is required and how that energy is supplied. Gregg

Q Dear Sir/ Madam, I have a small query regarding the fossil fuel emission ranking countries. I found in your website the countries ranking up to 2005, is it the same as in 2009 also? Do you have the list of ranking of countries as a whole (land use change, fossil fuel, deforestation) contributor of climate change and not just the fossil fuel? (3/4/09)

A If you go to our web site <http://cdiac.ornl.gov>, click on "fossil fuel CO₂ emissions", and then click on "preliminary 2006-2007..." you will find preliminary estimates for many countries for 2006 and 2007. By the end of June we should have final numbers for all countries for 2006 plus preliminary estimates for 2008. If you search our web site under "land-use and ecosystems" you will find some estimates for emissions from land-use change. These are very much less certain and are derived in very different ways so we do not try to sum them with the fossil fuel numbers. Gregg

Q WHAT IS THE TOTAL CARBON DIOXIDE EMISSION FOR TONGA PER ANNUM IN TONNES OF CARBON, AND WHAT IS IT PER PERSON IN TONGA (TONNES OF CARBON)? (3/3/09)

A It looks like 32 thousand metric tons of carbon (= about 117 thousand metric tons of carbon dioxide), and about 0.31 metric ton-carbon/person-year (= about 1.14 metric ton of carbon dioxide/person year). The site for documentation is: <http://cdiac.ornl.gov/trends/emis/ton.html> TJ Blasing

Q I was wondering if the UN statistics page - Carbon dioxide emissions (CO₂), thousand metric tons of CO₂ (CDIAc) - is going

something- just I dont know what (3/3/09)

A Robert we update our computations and data files every year as the required energy data become available. Currently these data extend through 2005 and you will find data on our web site through 2005. Also on our web site you will find preliminary data for 2006 and 2007. We are currently working on the final data for 2006 and expect to have that posted soon. By the end of June we will have preliminary data for 2008. When we update each year we not only add an additional year but we include some revisions of the previous year's estimates. As you noted, the data on the UN website extend only to 2004. These are our data from one year ago. My understanding is that they will update this file soon. With any luck we will have the 2006 dataset soon after they get the 2005 dataset in place. Gregg

Q Can you tell what are the exact frequencies of radiation that are trapped by carbon dioxide and converted to heat. Also, is it correct to say that substantially ALL radiation of those frequencies gets trapped and converted to heat at current levels of carbon dioxide? Many thanks! (3/1/09)

A Dear Bill Gummer, We appreciate your question to the CDIAC Web site. The radiation you speak of is already "heat" radiation because the frequencies of radiation absorbed by CO₂ are in the infrared (heat) portion of the spectrum. Here is a link to a good graphical representation of what wavelengths of radiation are affected by which gases: http://www.ude.edu/Geography/DeLiberty/Geog474/geog474_energy_interact.html. The whole page is quite instructive but scroll down to "Atmospheric Absorption and Transmission". Other versions of such a graph (a hard copy in a text I have) are a little clearer (plotting absorption rather than transmission), but the basics for CO₂ are absorption peaks at a little less than 3, a little more than 4, and at about 15 microns. The 15-micron point is especially apparent in the graph I've pointed to; i.e., CO₂ has an atmospheric transmission of zero at that wavelength (note the scale is not perfectly linear). To help understand the graph better, we often speak of a major "atmospheric window" at about 12 microns. At that frequency of radiation, very little is not transmitted by the atmosphere. Thus the peak in transmission on the graph. Now, why is more CO₂ important over time? It's basically a "question of balance". Right now, changing atmospheric composition means more heat being retained in the earth-atmosphere-ocean system (a lot in the oceans). For an authoritative discussion of this, see: http://www.nasa.gov/vision/earth/environment/earth_energy.html. If we kept CO₂ constant the earth would in time reach radiative balance again, but CO₂ concentrations are continually rising therefore this results in a "forcing" that serves to lead to a building imbalance. I've have copied a few colleagues on this in case they want to add some clarification. Sincerely, Dale Kaiser

Question: Can you tell what are the exact frequencies of radiation that are trapped by carbon dioxide and converted to heat. Also, is it correct to say that substantially ALL radiation of those frequencies gets trapped and converted to heat at current levels of carbon dioxide?

Q How do I contact cdiac.esd.ornl.gov/pns/faq_othr.html (3/1/09)

A Dear Timothy, That address has a comma in it. You want http://cdiac.esd.ornl.gov/pns/faq_othr.html. We appreciate your question to the CDIAC Web site. Sincerely, Fred Baes

Q HI Im trying to complete some university work and collate information regarding CO₂ emissions from Vanuatu. Which document would I require and can I ask for the web link? I have got http://cdiac.esd.ornl.gov/trends/emis/tre_coun.htm as a potential reference for CO₂ emissions country by country but I cant open the link?? Could you please help I would be very grateful, Thanks Rick (2/28/09)

A Ah, these computers are very picky. It looks to me like you should add an l (el) (i.e. html) to the end of your web address and it should work. If that does not work, let me know and we can try something else - it worked for me. Gregg

Q Dear Madam/Sir My question is about reporting of data; Halocarbons I am about to report the Halocarbons measured at Mt. Zeppelin in Norway, for the Norwegian Institute for Air Research. Our instrument is a GGMS. From the data that already have been submitted to the database I see that the GGMS data from for instance Mace Head (AGAGE) are in the ISO format. Is it so that you prefer to have the data in NARSTO format but other formats are accepted? Our data is in the NASA Ames 1001 format but it is possible for us to convert to other format(s), if needed. Thank you in advance for helping me. Best regards, Ann M. Fjaeraa (2/25/09)

A Dear Ann Mari, Which standard you choose to report your halocarbon measurements, whether it be NARSTO, ISO, or the Ames standards, is less important than the documentation which clearly identifies which standard you are using and the underlying measurement methodology. Our data center accepts data in a variety of standards and data sets that do not adhere to any standard. The ultimate utility of the dataset rests with the quality of the measurements, the care in processing and the preparation of sufficient documentation of all aspects of the collection, processing and reporting. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

Q > I understand that you are an authority on the global warming effects of > carbon dioxide. In 1952, I did research for my PhD thesis on the > emissivity/absorptivity of carbon dioxide, measured by integrating the > spectral absorptivity. My results agreed with the integrated measurements > reported by Hottel. These recent papers appear to agree with my conclusions > on the effect of carbon dioxide. Have you or anyone you know who is > involved in the modeling of carbon dioxide's contribution to > climate change evaluated these papers? > > http://biocab.org/Emissivity_CO2.html > > http://biocab.org/Carbon_Dioxide

Emissivityhtml > > While I am a strong advocate of energy conservation, reduction in the use > of combustible fuels and clean energy and I believe some of the effects of > sensitizing the public to these issues may have long term beneficial > effects. However, the current public predictions by the part of the > scientific community that has the ear of the media and world's decision > makers is creating public hysteria and is leading to economically > disastrous programs. Because of the significant impact that climate change > predictions are having on our emotions, life style and economy, I do not > believe that we can ignore the conclusions of these papers > > If you are aware of others who should review this material, please advise > me. > > Sidney Bernsen, PhD (2/25/09)

A Sidney, While I'm not a real expert in atmospheric radiation myself, I do have an M.S. in meteorology/climatology and work here in CDIAC analyzing climate records for trends and variability. As such, I'm fairly well versed in general global climate change studies and the published literature. Regarding the links you include below, I'm not inclined to try to read the material in detail myself because of my lack of expertise, but I feel it is important that evidently none of this work is published in the open literature. That is the true test of the author's mettle. If they feel strongly about the implications of their findings/conclusions, they should try to "really" publish them. Then they would be recognized. I do get the sense that for many people, even those knowing more about radiative transfer than myself (like YOU), there is some debate about the nature of exactly how more atmospheric CO₂ "traps" more heat. The best summary with regard to that I've seen recently is on the NASA GISS website (Jim Hansen). The emphasis is on the earth/atmosphere/ocean system being out of radiative balance because of the continual and increasing addition of atmospheric CO₂. Like their web page states, if the extra CO₂ emissions simply stopped, balance would be restored, but of course it's not stopping. http://www.nasa.gov/vision/earth/environment/earth_energy.htm See also: www.scienceonline.org/cgi/reprint/308/5727/1431.pdf I hope this is of some help. Regards, Dale Kaiser

Q Mr. Kaiser, Thank you for getting back to me so quickly. I need the annual high and low temperature for each state for 2005 and 2006. I saw that you had stations available but I was hoping you had it on a annual & state basis so I wouldn't have to check each station for each month. Thanks so much! - Emily On Wed, Feb 25, 2009 at 8:44 AM, Dale Kaiser wrote: Hi Emily, We'll certainly try to help. First, please clarify what you mean by "max/min temperature by state". What we do have via the USHCN database is: - Daily max/min temp at 1000+ stations (through 2005 in most cases). <http://cdiacornl.gov/epubs/ndp/ushcn/daily.html> - Monthly mean max/min temp at 1200+ stations (through 2005 in most cases). <http://cdiacornl.gov/epubs/ndp/ushcn/monthly.html> Just let me know. Dale Kaiser CDIAC > by state On Wednesday 25 February 2009 02:56 am, you wrote > To whom it may concern > > I am a graduate student majoring in economics at Illinois State University > and am working on a econometric study that requires the max/min temperature > by state for 2006 and 2005. I have had a extremely difficult time finding > this information and cannot readily find it available on your website > Could you please advise me as to whether you have this information and if > not, where to look? (I have already extensively looked at the NOAA website > with no success) > > I greatly appreciate your help > - Emily Hickey (2/25/09)

A Hi Emily, I thought that you may have meant literally one number for each state. Such by state numbers have been calculated but they have been expressed as "ranks" over the period of record, and can be found here: <http://www.ncdc.noaa.gov/oa/climate/research/monitoring.html> There are many interesting things on this page so I wanted to point you there first. From the above page, mouse over "U.S. Products". Then mouse over "U. S. Monthly Temperature and Precipitation!". Then select the year of interest from the choice that appear. I think the closest thing to what you want would be the entry in each table showing "Statewide Temp Ranks" and "Ann". For these ranks to be computed, of course annual values by state had to be computed. I just don't think they are on the site. You could look further, but you may end up having to contact someone at NCDC to ask them if the actual temp. values are available. A good place to start would be cmb.contact@noaa.gov, cmb meaning Climate Monitoring Branch. I'd be interested if you were in fact able to attain the values. Hope this helps. Dale Kaiser CDIAC

Q Hello, Do you have CO₂ emission data for biomass origin, which historically is a major source of CO₂? Thanks Daniel Gastelu (2/24/09)

A Have you by now found the part of our web site that has emissions from land-use change? <http://cdiacornl.gov/trends/landuse/houghton/houghton.html>? I think this is what you were looking for. Cheers, Gregg

Q Thank you for the access to daily weather records for stations around the country!! Its very nice, well documented and easy downloads etc. I use the data for modelling accumulated heat units impact on crop growth. Thank you! When will 2006, 2007, and 2008 be added to the database? Do you know where I might access station data for more recent years, on a site so well documented as yours? Thanks Edwin Anderson USDA/NASS, Statistical Methods Branch 202.720.5617 eanderson@nass.usda.gov (2/24/09)

A Dear Edwin, I'm glad to hear that our USHCN interface has been very helpful to you! The USHCN has been put together over the years by CDIAC/DOE's partners at NOAA's National Climatic Data Center. They are the real compilers and these days we step in and try to help them get the data to users in the way you've described. As far as updates, right now I'm focusing on getting the monthly data updated through 2008. Then, I hope later on in the spring to have daily data through 2008 updated on our site. In the meantime I'll give you the links to NCDC for newer data. If you don't need too many stations, it's pretty easy to get the data from them too. I hope this is helpful. So.... daily data - the Global Historical Climatology Network (GHCN) (contains all US stations you've seen on the CDIAC site) <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/> Version 2 of the "monthly" USHCN dataset <http://www.ncdc.noaa.gov/oa/climate/research/ushcn/> (Data are temporarily offline, I'm told they should be back this week or next). Don't hesitate to contact me w/ any further questions and thank you again for your support. Dale Kaiser CDIAC

Q How much carbon dioxide is generated by burning fossil fuels to generate 30,000 kWh of electricity (2/20/09)

A Geoffery. The answer depends on the mix of fuels (and other energy sources) used. There is also a difference between energy generated and energy delivered, the former being greater because energy is lost in transmission. My answers below are for electricity generated as per your phrasing of the question. For delivered energy the amount of carbon per kWh would be greater because the corresponding (delivered) energy is less. Most fossil-based electricity is generated from coal. A good average is about 0.975 g-CO₂/kWh. For natural gas, the number is about 0.543 g-CO₂/kWh. For oil, it's about halfway in between coal and natural gas, and depends on the type of oil (usually distillate or residual). Very little electricity is generated from oil. For 2007, 49% of our national energy was generated from coal, about 21% from natural gas, and less than 2% from petroleum. TJ Blasing

Q The data for the "Top 20 Emitting Countries by Total Fossil-Fuel CO₂ Emissions for 2005" located at "http://cdiacornl.gov/ftp/ndp030/natl751_2005.ems" describes CO₂ emission in terms of "C" only and not as "CO₂". Why is this so? Can I convert the "C" emission there to "CO₂" emission by multiplying those numbers with (44/12)? Is there any advantage or purpose behind reporting CO₂ emissions in terms of Carbon emission instead of CO₂ emission? Thanks Sunil (2/19/09)

A The carbon atom changes molecular partners as it moves through the "carbon cycle." In the atmosphere it is paired with oxygen as CO₂, in the ground it is paired with hydrogen as in methane (CH₄), in the plants it is paired with oxygen and hydrogen as in C₆H₁₂O₆. To understand the CO₂ in the atmosphere it is necessary to understand the exchanges between the biosphere, oceans, and atmosphere. See IPCC, Figure 7.3, in http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf. And, yes, the CO₂ formula also includes the oxygen, so 44/12 is all you need to convert. TJ Blasing

Q It would appear that after a brief check of carbon emissions from individual countries that values for forest fires are being omitted. I understand that the present Kyoto agreement does not include forest fires. Recent estimates of the carbon emission for the forest fires in Victoria, Australia are for a third of this country's annual industrial emissions. If not included then global values would appear seriously skewed. (2/19/09)

A Dear Michael, Thank you for your comment to the CDIA Web site. You are correct that our national fossil-fuel emission estimates do not include emissions from forest fires and that for a given year fire emissions can be quite large. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q Is CO₂ present in all of the atmosphere (2/19/09)

A Dear Gerald, Yes, CO₂ is present at all levels of the atmosphere from the surface to the high stratosphere as confirmed by aircraft measurements (upward to ~ 47,000 ft) and via sensors on satellites. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q Recent papers (A. R. Stine, P. Huybers, I. Y. Fung 2009 Nature 457 435, David J. Thomson 2009 Nature 457 391) suggest that the World Wars I, II had little effect on climate (they say 1900-1954 was "normal" in some sense (even peace and war being not too different), whereas 1954-2007 showed anthropogenic actions). I asked them about this, and was referred to your website. Are you indeed sure that the obvious wartime phenomena (vast use of inefficient fuel-guzzling transport (tanks, heavy lorries, off-road vehicles), of aeroplanes designed for performance rather than fuel economy (fighters, heavy bombers), large scale missions (the various Blitzes, the 1000-bomb raids) and continuous patrols, conflagrations in which cities were burnt down, vast amounts of munitions and shells exploded, factories working as fully as could be managed, with the emphasis on production more than on control of emissions) were so negligible? It seems very odd. Are the data as good for the wartime years? (2/18/09)

A Dear Marshall Stoneham, During wars, there is surely an increase in carbon emissions from military operations. However, there is just as surely a decrease due to operations taken out of production by military operations. Sincerely, TJ Blasing

Q I assume that the "best" way to remove CO₂ (to approximate pre-1800 levels) from Earth's atmosphere is to completely stop burning all fossil fuels, to reduce human populations down to less than 1 billion, and to allow forest re-dominance followed by a pre-Cambrian sort of flourishing of plant life - allowed to continue thus for several hundred million years. How else can the CO₂ overburden be surely, safely brought back down to less than 290 PPM without throwing some other biological systems into toxic imbalance? I don't understand those who suggest that CO₂ levels will "automatically" begin to correct themselves in a few thousand years. (2/18/09)

A Well, as a personal opinion, I'd say that you are on sort of the right track. There are two things that enter in now, though. One is that it appears to be possible to inject some CO₂ under pressure into deep geologic reservoirs in a way that it would stay there for a very long time. Two is that CO₂ will slowly mix through the atmosphere and ocean. Right now, the excess is largely in the atmosphere but given time and no more fossil-fuel emissions, the stuff already in the atmosphere will mix through the larger mass of the ocean so that the excess in the atmosphere will be less. It doesn't go away, it just gets equilibrated through a larger system over

time. But, as you note, this is not a great thing for current marine organisms. Humans have surely become a major force in the Earth's environment. Gregg

Q Let me re-state my question. If, as I understand it, it took multi-million years for the rather effective removal of "toxic" levels of CO₂ from deep-pre-historic earth atmosphere via natural biological processes, how can we expect to re-sequester all the CO₂ overburden we've liberated - from its wonderfully effective previous interment - in any way that takes less than a planet much covered with palms and ferns, and a time frame of multi-million years, without wrecking some other major biological system? (2/18/09)

A Well, as a personal opinion, I'd say that you are on sort of the right track. There are two things that enter in now, though. One is that it appears to be possible to inject some CO₂ under pressure into deep geologic reservoirs in a way that it would stay there for a very long time. Two is that CO₂ will slowly mix through the atmosphere and ocean. Right now, the excess is largely in the atmosphere, but given time and no more fossil-fuel emissions, the stuff already in the atmosphere will mix through the larger mass of the ocean so that the excess in the atmosphere will be less. It doesn't go away, it just gets equilibrated through a larger system over time. But, as you note, this is not a great thing for current marine organisms. Humans have surely become a major force in the Earth's environment. Gregg

Q Hello, My name is Jeremy Muenz and I am emailing you on behalf of the DC Habitat for Humanity Environmental Committee. Habitat for Humanity is a non-profit organization which builds affordable housing for low income families. For more information about the organization please visit www.dchabitat.org. The Environmental Committee is involved in making the construction of homes as environmentally friendly as possible and to increase their energy efficiency for occupants. For our next project we will be installing rain gardens for each home in efforts to better the local environment. The DC Department of Environment will give the DC Habitat for Humanity a grant to offset the cost of this installation. To receive this grant we must apply. The application involves our group to submit data on what we will be building, how much it will cost, its benefit to the environment, etc. For us to do this we need historic precipitation information. To be more specific, we need to know what has been the most rainfall that has fallen on the Washington DC area within a 24 hour period within the last 10 and within the last 20 years. Based on your website I felt you may be able to help us with obtaining this information. Do you have records which could help us with this? Please let me know if you would be able to help us out. If you have any questions or comments please do not hesitate to ask. Thanks and I look forward to hearing from you! Regards, Jeremy (2/18/09)

A Jeremy, an alternative source http://www.weather.gov/climate/local_data.php?wfo=lxw. Click the first link - "Reagan National Daily Normals, Means, and Extremes". You can go through month by month and look at the column near the right labeled MXPCP. That's the max. precip. observed for that particular day of the year, and the year it occurred is given to its right. You can slice and dice these data any way you want as far as period of record, it will just take a little while to analyze for your purposes. This source, being an official compilation by NOAA, can be trusted and cited, in my opinion. And, btw, the data I sent you before I opened in a spreadsheet and used the MAX function for every day of the month. Based upon the period of record for that file (started in July 1945), I got a match for the the greatest precip. post-1945, i.e., 6.11" ("1552" in tenths of mm) on June 21, 1972 - which was Hurricane Agnes. I remember it well; I'm guessing you may not have been born yet... Have fun. Dale Jeremy, Always glad to help out a good cause. And we are a Dept. of Energy group down here at Oak Ridge National Laboratory so there is an obvious connection here. There are many ways to tackle this problem, but I think getting data into your hands from National airport is the easiest and probably best solution for your purposes. The National Climatic Data Center (NCDC) in Asheville, NC is our country's (and the world's) chief climate data archive (part of NOAA/Dept. of Commerce). Any and all data related to weather/climate can be found there www.ncdc.noaa.gov. Anyway, I've grabbed just the daily precip. records from National airport from this global database <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/>. These data are attached in the file national_daily_precip.txt. The other file, ghcn_d_readme.txt gives the format of the data records in this file (see section III). You'll see that each record holds one month of data, with 31 repeating fields (each with a precip amount plus certain data flags) for each day of the month. If a month has less than 31 days, non-existent days are filled with "missing" indicator explained in the readme. The precip units are a bit unwieldy, i.e., since these records come from a database geared for international use, the original precip. amounts (measured to the nearest hundredth of an inch here in the old-fashioned USA) have been converted to metric. They are given in "tenths of millimeters". What does this mean? Well, by example a value of 254 would be 25.4 mm (i.e., to the nearest tenth of a mm), and 25.4 mm = 2.54 cm = 1 inch. So, to get the daily rainfall amount in inches, simply divide each value by 254. I hope you or maybe a colleague that's good with numbers/software can use the data to extract your values of interest. If not, I would hesitate to be the "official source" of saying "the highest daily rainfall amount at DCA over the past 10 years was XX inches". That would probably be best for someone from NCDC. You can find contact info. on the website. You CAN certainly say "the raw data were obtained from the GHCN climate database at NCDC". If this is just all too messy and confusing, holler back and I'll extract the max. precip. amounts. But I'd feel best if you all could go in-house or through NCDC. Just let me know. Sorry to be so long-winded. Dale Kaiser CDIAC 865-241-4849

Q Can you please tell me the most recent statistics for: 1) global CO₂ emissions per day? 2) Global Greenhouse Gas (GHG) emissions per day? Thank You, Andres Edwards (2/16/09)

A Dear Andres Edwards, We appreciate your question to the CDIAC Web site. An approximation of global CO₂ emissions per day (strictly from combustion of fossil fuels) would be about 22 million metric tons. This is obtained by dividing 8000 million metric tons per year (2005 emissions estimate) by 365 days. These data are available here: http://cdiac.ornl.gov/trends/emis/tre_glob.html. As far as GHG total emissions per day, there are many GHGs. More information can be found here that may give a

helpful start http://cdiac.ornl.gov/by_new/bysubject.html#trace particularly for methane I have copied a few of our resident CO₂ emissions experts on this email in case they have some helpful info. to add. Regards Dale Kaiser CDIAC Question Can you please tell me the most recent statistics for: 1) global CO₂ emissions per day? 2) Global Greenhouse Gas (GHG) emissions per day? Thank You, Andres Edwards Sincerely

Q Everybody can understand and share the climate change solutions issue. While the United Nations experts and negotiators have gathered in Poznan for two weeks, consumers continue to experience issues with climate change. Most of them have to improve their insulation or to reduce their petrol consumption, all can understand it is time to react in a proper way with sustainable solutions. Cefic has just issued a cartoon for them to explain why the chemical industries promote benchmarking as a method of allocation of CO₂ emission rights in the Emissions Trading Scheme. This cartoon is a way to show that the benchmarking vs. auctioning debate is not a topic reserved for an elite of specialists. Using a humorous tone and serious arguments, the Jumping the climate change hurdle cartoon shows that we all benchmark when seeking the best value for money as we do our shopping. Comparing apples to apples is not so different an exercise than comparing CO₂ performances in one industrial sector: it's still benchmarking. Everybody can easily understand then that it is not fair to treat all performers regardless of their efforts and appropriate investments. Some simple and entertaining pictures provide explanations using metaphorical tools (such as sports ones) and showing that companies need to be competitive to provide innovative solutions for a sustainable climate solutions management. Additional CO₂ expenses that would not be allocated to favour low carbon technologies would not help efficient climate change efforts.. To avoid that, climate change is definitely the tool of choice.. and the cartoon a way to combine fun and learning. This cartoon is also an opportunity for European Industries to show that they are already setting good examples of good practices to the rest of the world. Without the Emissions Trading Scheme, they are reducing their own greenhouse gases emissions year after year. But to go on doing so, they need the right tool. Welcome on board. It is highly essential that you contribute to disseminate this cartoon or links on it. Climate change is indeed an issue that will have consequences on our lives. You can watch the cartoon on YouTube: http://fr.youtube.com/watch?v=b1kf_axslfk or on Daily Motion: http://www.dailymotion.com/Aleria2008/video/x7lnjh_changementclimatiquedu-boulotpou_news Philippe de Casabianca Senior Counsellor Communication Energy, HSE & Logistics Program mepca@cefic.be Tel: 0032 (0)2 676 74 52 Mobile 0032 (0) 497 45 47 90 avenue E van Nieuwenhuys 4 B-1160 Brussels Cefic - European Chemical Industry Council (www.cefic.be) (2/15/09)

A Dear Philippe, Thanks for the pointer to the Cefic cartoon through the CDIAC web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Your CO₂ emissions from coal burning data for Australia experiences a sharp decline in 1998, whereas the International Energy Annual 2006 of EIA shows no such decline in the coal consumption (sources <http://www.eia.doe.gov/pub/international/iealf/table4.xls> <http://www.eia.doe.gov/pub/international/iealf/table4.xls>). Could you please help me deal with this difference, (2/15/09)

A Dear R. Shanthini, We appreciate your question to the CDIAC Web site and I apologize for the delay in responding. Our emission estimates are based on the United Nations Energy Statistics Database (UNSTAT). According to UNSTAT, gross production of coal for Australia declined by 9.2% while coal exports increased 5.9% from 1998-99 (please see data below pulled from UNSTAT). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodent@ornl.gov Obs qcode country cdy trans year quantity1 WSR 36 CL 01 1998 2210922 WSR 36 CL 01 1999 2007373 WSR 36 CL 04 1998 1622974 WSR 36 CL 04 1999 171861 Countrycode 36 = Australia Transactioncodes 01 = gross production 04 = exports qcode = units WSR = thousand metric tonnes cdy = commodity code CL = coal

Q 1) Where did you get the data for your Global Fossil Fuel Emission estimates, Trends, data columns, and graphic plots? 2) What were the methods used? 3) What assumptions were involved? (2/14/09)

A Bernie, if you go to our home page and click on fossil fuel CO₂ emissions at the bottom right of the page, all of the data sources and computational methods are described and referenced in considerable detail. Cheers, Gregg

Q In the data posted here http://cdiac.ornl.gov/ftp/ndp030/nation1751_2005.ems as estimates by Marland, Boden & Andres some estimated CO₂ emissions (for Mexico in 1914, Kuwait in the 1950s, and a few other countries in different years) are negative. How emissions can be negative? Thanks in advance for your attention. Yours sincerely J. A. Tapia Granados (2/13/09)

A Dear Jose, The negative national emission estimates for select years and countries are artifacts of the underlying production and trade data and, in some cases, our accounting methodology. For example, in the case of Mexico for 1914 the only data available were export data. There were no production data available. Another example of a data error might be where a country exports more coal than it imports or mines resulting in a negative "net apparent consumption of coal". Other select cases result from our methodology where a fuel is converted from one form to another (e.g., liquid to gas fuel). The liquid accounts are debited while the gas accounts are credited and may result in some cases in negative liquid emissions. In summary, these are errors but our help is better and more complete data will become available in the future. Thank you for your question to our web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am planning to do an Earth Science Project with my Earth Science students I would like each student to perform a scientific investigation about how much carbon dioxide is released into the atmosphere over a month at a specific location. We don't have money in this year's budget for a carbon dioxide monitor. Specifically, where could my students access data on a daily basis, or is low cost equipment available? (2/11/09)

A If your emphasis is on the biologic flows of carbon dioxide, you might look at the Ameriflux data on our web site (and at the methodology for making the measurement). If your emphasis is on the fossil fuel and human related CO₂ flows, these are mostly calculated from fuel-use data rather than measured. It is relatively straightforward to find the coefficients to convert fuel consumption to CO₂ emissions. By "specific location", are you talking about a leaf, a yard, a home, a city? Gregg

Q I am trying to determine the approximate CO₂ emissions/capita for 3 countries—the US, Sweden and Kenya. The numbers on a wikipedia site based on your numbers were in metric tons: USA 20.4, Sweden 5.9 and Kenya .31. (I looked up "CO₂ emissions per capita by country" and there was a lovely chart). Then I used your site itself to find more contemporary data from 2005. Your site said USA 5.32, Sweden 1.46, and Kenya .9. I am very confused by the difference. Could you explain and give me the most accurate figures in metric tons that you have per capita for each of these three countries? I greatly appreciate your help. Thank you very much. Sincerely, Linda Butler (2/11/09)

A Linda, emissions of CO₂ can be reported as either the mass of CO₂ or the mass of the carbon in the CO₂. Researchers focused on the atmosphere tend to prefer mass of CO₂ whereas those focused on the cycling of carbon tend to prefer the mass of carbon. Both are entirely correct and they are easily interchangeable. Multiplying by the ratio of the masses of CO₂ and carbon (44 divided by 12 = 3.67) will make the conversion. In this case you will still not get a perfect match, because our data are revised and updated annually, and others who report our data often will still show the previous year's estimates. I would stick with the numbers on our web site. Note too that our web site does give, in a separate file, initial estimates for the US and Sweden for 2006 and 2007. For Kenya, 2005 is the most recent data. Cheers, Gregg

Q The data on your site refers to fossil fuel emissions. Is there a simple formula to convert this to total greenhouse gas emissions, or do other greenhouse gas emissions vary significantly from country to country? Is there a big difference between the two measures? Thank you in advance to your kind attention to this question! Johanna Koolemans Beynen (2/11/09)

A Hello, Thanks for your question. The term "fossil fuel emissions" is often used synonymously with CO₂ emissions, although the terms should be used together if the CO₂ comes from the burning of oil, coal, natural gas, etc., or their derivatives (e.g., heating oil or gasoline in the case of oil). So, if you see fossil fuel emissions by itself, the real reference is to CO₂. Greenhouse gases include many other gases in addition to CO₂, and yes, like CO₂, vary significantly across countries. Please see: http://cdiacornl.gov/pns/current_ghg.html for more explanation. Regards, Dale Kaiser CDIAAC

Q Could you tell me where to find the most recent information on CO₂ emissions by country and per capita? I checked your listings, but the most recent data is only for 2005. I have read that by 2007 China had surpassed the U.S. as the leading greenhouse gas emitter, but I don't know where that information originated. I'm in the process of updating an environmental health textbook that I have authored and would like to have the most current information. I thought that I would find it on your site, hence was disappointed that the data there isn't up-to-date. (2/9/09)

A Anne: Go to: http://cdiacornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2006_2007.xls for preliminary estimates through 2007. For a press release, see: <http://www.newswise.com/articles/view/544651/>. Near as we can tell now, China passed the U.S. in 2006, but error terms make it impossible to pinpoint. Sincerely, TJ Blasing

Q I am confused. Data for CO₂ emissions for the U.S. in 2004 on your website is 1,563,923 (thousand metric tons). However, when I look at the UN's statistics and other websites that have referenced your site, they give the figure at 6,049,435. Am I looking at the wrong page on your website? I am trying to find out about CO₂ emissions per country. Help please. (2/5/09)

A Lynn, emissions of CO₂ can be reported as either the mass of CO₂ or the mass of the carbon in the CO₂. Researchers focused on the atmosphere tend to prefer mass of CO₂ whereas those focused on the cycling of carbon tend to prefer carbon. Both are entirely correct and they are easily interchangeable. Multiplying by the ratio of the masses of CO₂ and carbon (44 divided by 12 = 3.67) will make the conversion. In this case you will still not get a perfect match, probably because our data are revised and updated annually, and others who report our data often will still show the previous year's estimates. Gregg

Q The link <http://www.gvm.jrc.it/glc2000/> On your Africa Carbon estimate map for Africa 2000 by Gibbs & Brown returns an error message of bad host. (2/4/09)

A Dear Robert A. Washington Allen, Thank you for alerting us to the bad link on our NDP-055b Web page. The correct link for the GLC2000 land cover database is: <http://www.tem.jrc.it/glc2000/>. We have updated the CDIAAC Web site with the correct URL. We appreciate you taking the time to point out the problem to us. Sincerely, Fred Baes

I Hi Dale. Thanks for the reply. I do want data for all 48 states. I am not sure on the format. It possible that I can get something

Q | simple ASCII file, e.g.). If you don't want netCDF format, do you still want data from over the whole country? Based upon your answers, I'll be able to help you get the data for sure. Best, Dale Kaiser CDIAC 865-241-4849 On Wednesday 04 February 2009 01:52 pm, you wrote > Hello, >>> I am trying to access snowfall data for the US. I have tried using the > ftp service online and can't get the file I need to open. Is there > another way I can access this information or it could be sent to me? > The file I need is >>> ndp070_snow.nc.Z >>> Thanks >> Nick Nelson >>> Nick Nelson, MPH (2/4/09)

A | Hi Nick, Following up on our conversation.. http://ams.confex.com/ams/87ANNUAL/techprogram/paper_118775.htm (That attached graphic us snow trends.png is an example from the above abstract) http://www.climate-source.com/us/fact_sheets/fact_snowfall_us.html <http://www.ncdc.noaa.gov/ussc/index.jsp> <http://lwf.ncdc.noaa.gov/oa/climate/online/ccd/snowfall.html> Also see the attached file. Dale

Q | I'd like information on sensitivity of coastal areas to rising sea levels, as well as any other data you have related to climate change. Thank You! (2/3/09)

A | Sapna We don't have anyone here who is an expert on coastal sensitivity to sea-level changes. Robert Nicholls might be able to help. R.J.Nicholls@soton.ac.uk TJ Blasing

Q | Dear Mr. Blasing, Could you pls assist me in obtaining the worldwide CO₂ emissions from the combustion of fossil fuels for 2006, 07 and perhaps an estimate for 2008? The current report stops at 2005. http://www.eia.doe.gov/pub/international/real/tables/h1_CO2.xls Thank you. (2/1/09)

A | Try http://cdiacornl.gov/trends/emis/meth_reg.html and go to the 3rd bullet down for preliminary estimates for 2006 and 2007. It takes awhile for the U.N. to audit the reports from each country and assemble the data. Hence the delay. I think the 2006 numbers will be included in the historical sequences soon. TJ

Q | Carbon dioxide emissions data collected in 2004 by CDIAC for the United Nations concerning the USA should be 6,049,435 in thousand metric tons. But the Total Fossil-Fuel-caused CO₂ Emissions of the USA in 2004 should be according to your homepage 1,563,923 in thousand metric tons of carbon. 1) Why such a large difference? 2) Should the unit in your homepage "in thousand metric tons of carbon" not be corrected to "in thousand metric tons of carbon dioxide"? 3) Can the data 6,049,435 be found in your homepage? If yes, pls tell me the link! (1/30/09)

A | Emissions of carbon dioxide can be accurately represented by the mass of carbon dioxide or by the mass of the carbon in the carbon dioxide. Either is correct; it is a matter of personal preference. We report the mass of carbon, some other data sources report the mass of carbon dioxide. Knowing one it is simple to calculate the other, the conversion factor is the ratio of the molecular weights, that is 44 divided by 12. So if you multiply our estimate by 44 over 12 = 3.667 you should get something quite close to the other estimate that you have found elsewhere, measured as the mass of carbon dioxide. Cheers, Gregg

Q | Thank you so much for your valuable work. One simple question we encounter is why there is no recent data available for CO₂ estimates? For example, we have 2005 data to the year 2009. I understand the amount of work and preparation that goes to putting together such a comprehensive data especially globally but I wanted to make sure I am not missing any point. Best regards Mehdi (1/29/09)

A | Mehdi, Look back at http://cdiacornl.gov/trends/emis/meth_reg.html and you will find the preliminary data for 2006 and 2007. Final data for 2006 will be available soon and preliminary data for 2008 will be available around the end of June. Since these estimates are all based on UN statistics on energy use, it takes about 2+ years beyond the end of a year to assemble and process all of the energy data. Cheers, Gregg

Q | Please remove the reference that contains my personal address from your website. Please follow up as soon as possible as this constitutes an invasion of privacy and could be an identity theft. See the entry that appeared when Google was searched: Page 1 Page 2 ORNI/CDIAG-77 NDP-026B EDITEDSYNOPTIC CLOUD REPORTS... File Format PDF/Adobe Acrobat - View as HTML Isaac Savdie, CMCC, 224 Glenmanor Way, Thornhill, Ontario L4J3E5, Canada 287. G. S. Say 1er, Professor, 10515 Research Drive, Suite 100, The University of ... cdiacornl.gov/ (1/28/09)

A | Dear Isaac, Thank you for bringing to our attention that your mailing address resides in one of our on-line data documents. We are addressing this issue now. Google is a wonderful tool but like most things has indiscriminate features too. At your request, you were included on a mailing distribution list for the revised Warren and Hahn cloud database published by our data center in 1996. Back in the days before pdf files and identity theft, it was not uncommon to include mailing lists in published documents. This mailing list was included in the pdf version of the database documentation as we "digitized" old word processing data documents for inclusion on our data center web site. When the Google search robots visit our web site they read and capture everything without any regard for content or relevance. We are re-creating the pdf file without the mailing list, which were the final three pages of a fifty page document. The Google robots should see the document has changed during their next harvest of our web site and modify their catalog and search inventories accordingly. We certainly hope no harm or inconvenience to you arises from our blanket digitizing of these old, but still very useful, reports. Thank you again for pointing this out to us. Sincerely, Tom Boden

Q Dear Sir or Madam, I am working on an educational DVD to be used in schools. For this, I am looking for historic data of carbon dioxide emissions. I found your great table with values for carbon emissions from fossil fuels going back to 1751, but I would like to show some more detail. So I am looking for carbon dioxide emission total, not only from fossil fuels. Especially when we go back in time, other sources (mainly wood) become increasingly important. I am looking specifically for data for the years 1925, 1860, 12,000 BC, and 30,000 BC (carbon dioxide emissions from fossil and other fuels). Do you have a hint where I could find such data? This would be great! Thanks in advance for your help, Jens Jacobsen (1/28/09)

A On our web site you can find CO₂ emissions from land-use change back to 1850 (a file attributed to Richard Houghton). Prior to that it becomes pretty speculative. I have seen papers that discuss early land clearing and CO₂ emissions but we have not archived the data. I would think that an e-mail to Richard Houghton (Woods Hole Research Center) might find someone who knows this data. Fossil fuel use was tiny before 1750 and I do not know of any actual numbers. Gregg Marland

Q CO₂ emissions from Pakistan need correction. Country name is now Pakistan not East and West Pakistan. Data for India is available from 1850 to current date however for Pakistan the presented data is from 1945 to 1970. Kindly update this data. The data presented for India from 1850 to 1947 can be used for Pakistan. SUPARCO has been involved in air pollution monitoring activities and many studies have been published. Is there any opportunity available to do collaborative study under CDIAC. Kind Regards (1/27/09)

A For countries that have changed identity or name it is sometimes challenging to follow the data streams, but I think that we have everything somewhere. If you look closely at our data you will find that we have data for "East and West Pakistan" for 1946 to 1971. For 1972 to 2005 there is a separate file identified as "Pakistan". Within a month or two we will add 2006 data for Pakistan. Our analyses are aided by a memorandum of understanding with the United Nations Statistics Office. I would not rule out a collaborative project, but it is not something that we ordinarily do. Thanks for writing to keep us on the ball. Queries from data users always help us to identify data problems and to keep the data set up to date. Best wishes, Gregg

Q Where can I find historical series on carbon emissions for three groups: developing countries in total, western Europe in total, and eastern Europe in total. Would like to have these data back to the earliest date available. Thanks R. Doyle (1/26/09)

A The following link will provide information on carbon as carbon dioxide from consumption of fossil fuels and cement manufacture: <http://cdiacornl.gov/trends/emis/overview.html>. Hope this helps. TJ Blasing

[from Gregg Marland] Rodger, If you go to our web site (<http://cdiacornl.gov>), click on "fossil fuel CO₂ emissions" at the bottom right of the page, and then follow the "regional" signs, you will find regional data for 10 global regions. I think you should be able to combine these in a way that will get your 3 regional sums. It does, of course, depend on exactly how you want to define your regions (i.e. which countries are included). You will see, for example, that we did not know the best way to assign Germany with Eastern Europe or Western Europe, so show it as a separate region. You will also find sums for all Annex B and non-Annex B countries and Non-Annex B may be what you want for "developing countries". Gregg

Q Dear Sir/Madam, At the Department of Environmental Affairs and Tourism (South Africa) we are in the process of compiling a set of Environmental Sustainability Indicators. One of the focus indicators we are using relates to CO₂ emissions per capita. I have managed to access the country-specific data for South Africa from your database providing the CO₂ per capita for fossil fuels (liquid and solid), gas, and cement. I have also managed to retrieve a similar dataset from the UNSTATS website: <http://millenniumindicators.un.org/unsd/mdg/SeriesDetail.aspx?srid=751&crd=710>. The values indicated for CO₂ emissions per capita are referenced to be supplied by CDIAC, however there is a great difference in the values between the years, i.e. values from your database give CO₂ per cap for 2004 as 2.43 versus the values on the UNSTATS database as 9.19. Could you kindly inform me whether the information supplied to the UNSTATS has included any other sources of CO₂ emissions other than the four used in your calculation? If possible would you be so kind as to please provide us with the full dataset used to calculate the values? Kind Regards, Leanne Hart-Richards (1/21/09)

A Dear Leanne, We appreciate your question to the CDIAC Web site and interest in our fossil-fuel emission estimates. The two sets of numbers in question are virtually identical. Our per capita estimates are expressed in units of carbon, while the UN estimates are expressed in units of carbon dioxide (CO₂). To convert our units to theirs simply multiply by 3.67 - the difference between the molecular weight of carbon versus CO₂.

[44/12]. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, bodenta@ornl.gov

[from TJ Blasing] Dear Leanne, I suspect the difference is between carbon and carbon dioxide. One is 3.66667 times the other. $9.19/3.66667 = 2.5$ which is carbon only, which is what our numbers represent. That's not exactly 2.43, but they may not be counting cement manufacture and/or international bunker fuels. TJ Blasing

Q Dear Sir Madam, I am working on the impact of Climate change on marine ecosystems within CEFAS a UK government agency. At the moment I am investigating the possibility to set up experimental facilities to carry out work on the effect of ocean acidification on marine environments. This will of course require the development of a method to measure all Carbon forms in the water. I've had a look at the report for the "Program developed for CO₂ system calculation" and this seems to be what we need. I would be grateful if you could send me more information regarding the equipment used for measurements, the set-up with the computer system and the computer program itself. Yours sincerely (1/21/09)

A Dear Dr. Sophie Pitois, My name is Alex Kozyr and I am responsible for all CDIAC Ocean CO₂ data management activities. Beside of the "Program developed for CO₂ system calculation", I would offer you to read the new Guide to best practices for ocean CO₂ measurements. We do have a hard copy of this book and I will send it to you. Also, you can get the electronic PDF copy of the book at: http://cdiac.ornl.gov/oceans/Handbook_2007.html. The book explains all the methods of CO₂ related parameters, measurements and equipment needed. This book along with "Program developed for CO₂ system calculation" (<http://cdiac.ornl.gov/oceans/CO2rprt.html>) is all you need. Please let me know if you have any questions. Regards, Alex. P.S. Please send me your mail address, so we could send you a book. How many copies would you prefer?

Q Is it possible to have access to the delta 13C atmospheric values (from Mauna Loa for example) monthly from January to December 2003 or the average value for that year 2003? If yes, please tell me where can I get these values? Thank you very much in advance. Dr. I. Fernandez, Instituto de Investigaciones Agrobiológicas de Galicia (CSIC) Santiago de Compostela, Spain (1/21/09)

A Dear Dr. Fernandez, The data you requested can be found at <http://cdiac.ornl.gov/ftp/trends/CO2/iso-sio/mla.dat>. The 2003 data are not yet posted at that URL. You may need to contact Dr. Keeling directly for the 2003 data. Sincerely, Robert Andres

Q Have you any plans to update these data soon? <http://cdiac.sd.ornl.gov/trends/temp/angell/angell.html> (1/21/09)

A Dear Roger Coppock, We appreciate your question to the CDIAC Web site. I think Jim Angell has retired, but NOAA has continued to monitor the upper atmosphere. The link at: <http://www.gfdl.noaa.gov/aboutus/milestones/ozone.html> gives a nice summary of the processes involved. Sincerely, TJ Blasing

[from Dale] Roger, Indeed, I have recently received Angell data up through fall of 2008 and should be able to update things within the next month or so, so please watch that space. Regards, Dale Kaiser CDIAC

[more from Dale] Roger, The Angell time series have been updated through the fall of 2008 and are available on the CDIAC website <http://cdiac.ornl.gov/trends/temp/angell/angell.html>. Good luck with your research. Dale Kaiser CDIAC

Q Your calculation for the burning of 1000 cubic feet of natural gas was both clear and concise. I am producing a board game based on carbon trading and the players must decide which power plant to invest in. Therefore my question is: "How much CO₂ is emitted by burning 1 tonne of each of the three big fossil fuels, gas, oil and coal." (1/20/09)

A Conall, It sounds like good potential for a fun game. The first problem is units. Coal, for example, is quite variable and it is hard to provide an emissions coefficient in terms of tons - the emissions can be quite different for a ton of low grade coal as opposed to a high grade coal. The best way to do this is in terms of the heating value of the fuel. For example, we work in terms of kg carbon per joule of fuel. A joule of fuel may not be the simplest thing for folks in general to appreciate as they play a board game. But it is also hard to compare a cubic meter of gas with a barrel of oil and a ton of coal. You might be able to simply work with a comparative term that shows kg of carbon (or carbon dioxide) per unit of fuel when YOU know that the unit of fuel is in joules, but you do not have to fully explain this. In any event, you can find a list of the emissions coefficients recommended by the Intergovernmental Panel on Climate Change by clicking through the following sequence: Start at <http://www.ipcc.ch> and then click through this sequence: Ipcc reports Methodology reports 2006 ipcc guidelines Volume 2 Chapter 2 Page 2-16. And let me know if this is not clear or if you run into problems. Gregg Marland

Q To whom it may concern, Thank you for sharing the helpful information on GLOBAL CO₂ EMISSIONS FROM FOSSIL FUEL BURNING, CEMENT MANUFACTURE AND GAS FLARINGS 1751-2005. Are the figures for pure CO₂ or for CO₂ equivalents (including all greenhouse gases)? If it is for pure CO₂; is there a way to transform the figures to CO₂ equivalents by using some formula? Which? Thank you very much in advance for your kind help in clarifying this issue. With joyful regards, Mia Lohman (1/19/09)

A Mia, the numbers on our web site are only for CO₂ and do not include any other greenhouse gases. For all other greenhouse gases, emissions can be converted to CO₂ equivalents by multiplying the emissions number by a "global warming potential". For carbon dioxide, the "global warming potential" is, by definition, one. Every greenhouse gas has a "global warming potential", which describes its impact on the climate as compared to that of carbon dioxide. My suggestion is to simply Google "global warming potential", and if that does not lead to a satisfactory explanation, let me know. I hope you are getting lots of nice snow there in Finland. I am coming over to Finnish Lapland in March to try some cross-country skiing. Gregg

Q Dear, i'm searching CO₂ emissions data concerning Saudi Arabia Do you have these data? They are available? or how much is it? Thankyou for your disponibility Best regards Simone Pedrazzini (1/19/09)

A Dear Simone, Yes, we do have annual fossil fuel CO₂ emission estimates available for Saudi Arabia. The data are free to anyone and may be found on our Web site at http://cdiac.ornl.gov/trends/emis/tre_sau.html. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

[from TJ Blasing] Simone http://cdiac.ornl.gov/trends/emis/tre_sau.html Will give you the annual data through 2005. Please read the cautionary material at the bottom of the page, and cite as requested. Also, note that this is the carbon only; to include the oxygen to make the CO₂, multiply by 44/12. 109169.9 and 115338.4 thousandsof (metric) tons of carbon are preliminary estimates for 2006 and 2007, respectively. They may be found at http://cdiac.ornl.gov/ftp/trends/emissions/Preliminary_CO2_Emissions_2006_2007.xls TJ Blasing

[from Gregg Marland] Simone, If you go to our web site at <http://cdiac.ornl.gov> and click on "fossil fuel CO₂ emissions" at the bottom right of the page, it will lead to you to emissions estimates for all countries. Estimates are in terms of the carbon contained in the carbon dioxide, so multiply all numbers by 3.67 if you want to know the mass of carbon dioxide. Gregg

Q I would like to obtain the numbers for the CO₂ concentrations from ice cores taken at Law Dome, Antarctica specifically the numbers shown on the graphs on your website. Thankyou. (1/18/09)

A Dear James Shea, We appreciate your question to the CDIAC Web site. I'm not sure if anyone else has responded to your question already. I'm sorry for the delay. To get the actual data values for the law dome plots, click on the "Digital Data" link on this page: <http://cdiac.ornl.gov/trends/CO2/lawdome.html>. If I'm not interpreting your question correctly, please feel free to contact us again. Sincerely, Dale Kaiser CDIAC

Q How can I show the calculation of the amount of carbon dioxide car emits with all the details and numbers? (1/18/09)

A Consumption of gasoline emits roughly 19.6 pounds of carbon dioxide per gallon of gasoline. If you want to include the amount of CO₂ emitted in discovering, refining and delivering the gasoline, it is a bit more of a calculation. Likewise if you want to include the CO₂ emitted in manufacturing the car. Cheers, Gregg Marland

Q What is the percentage of CO₂ mined in natural gas. As this is separated out in the processing of natural gas to produce a usable product what is done with it. (1/16/09)

A Dear Terry Furler, We appreciate your question to the CDIAC Web site. We may have sent you the answer to someone else's question by mistake. I would ask Gregg Marland at: marlandgl@ornl.gov. Sincerely, TJ Blasing

Q By sheer coincidence I came across this graphic <http://cdiac.ornl.gov/trends/temp/sterin/graphics/global.gif>. I am interested in some 'text' concerning development in tropospheric temperatures - e.g.: <http://cdiac.ornl.gov:8080/xml/cdp/metadata/Trends/Temp/Angell.xml> (a paper I found via 'Meta Search' on your web site). Could you possibly let me know how to retrieve mentioned paper (or one with similar info)? (1/15/09)

A Dear Hans Henrik Hansen, We appreciate your question to the CDIAC Web site. Some material on this graph can be found at: <http://cdiac.ornl.gov/trends/temp/angell/angell.html> and the accompanying references listed near the bottom of the page. The generic reference is the Angell and Korshover paper and I think Angell 1991 gives material on the graph presented. Sincerely, T.J. Blasing

Q Is there any data available on the CO₂ content of fresh rain water compared to the concentration near the ocean's surface? Thankyou very much. Robert L Hamilton Richardson, Texas (1/15/09)

A Dear Mr. Hamilton, I apologize for the delay in my reply to you regarding your question, but I was checking with various sources as to if the data you want are readily available. I do not have the data you requested personally. It took awhile to get replies from those I contacted. The question you ask is actually filled with some very interesting chemistry. As you may know, CO₂ exists in the atmosphere as a gas. When in contact with water, for example rain drops or sea water, it begins a series of transformations as it changes from gas to liquid phase. In the liquid phase it undergoes another series of transformations as it changes to carbonate and bicarbonate ions. All of these reactions/transformations fall under the general category of carbonate equilibria. The science behind carbonate equilibria is fairly well known and I suggest you check out a chemistry or geochemistry textbook if you want to learn more about it. The equilibrium process involved can be approached at many levels ranging from high school chemistry to graduate level work. As for the details of your question, there is much data available for CO₂ concentration in sea water. One place you can start looking is at <http://cdiac.ornl.gov/oceans/home.html>. I am not aware of where to find CO₂ concentration data in rain water; I would be surprised if it did not exist. I just do not know where it exists. As for finding data on CO₂ concentrations in both rain water and adjacent ocean surface water, I do not know of any such measurements. I can imagine the difficulties in such a sampling campaign and would be surprised to find out if such data even exists, especially in any appreciable quantity. Sorry I could not directly supply you with the data for which you asked. Sincerely, Robert Andres

[Hamilton replies & Bob replies] Dear Dr. Hamilton, You have brought the question around to one of kinetics. That is, relative diffusion rates as a function of temperature differences across the gas-liquid interface of a raindrop. CO₂ gas diffusion into/from water at a variety of temperatures is well known. As to their exact magnitudes, I do not know those numbers off the top of my head, but I would suspect a CRC Handbook of Chemistry would contain them. I do not know of anyone who is looking at this particular context of rain, CO₂, and climate change. That does not mean that no one is looking at this context, I am just unaware of that work. Sincerely, Robert Andres Hamilton, Robert L wrote: > The point is – the bolides are formed high in the atmosphere where it is much colder and so, they must be supersaturated when they reach the surface. I know they are colder than surface ambient temperature. . . > I just wondered if anyone is actually looking at this. >> thnx >> Dr Robert L Hamilton

Q At 300 parts per million by volume, the weight of the CO₂ in the air is 5*(10)**15 pounds. To produce the increase in the Keeling curve you need to add over 10**13 pounds per year. Where does such an amount originate? It cannot be from burning fuels of any sort. (1/13/09)

A Current global fossil carbon emission is about 2*(10)**13 pounds per year. So we do burn a lot of fuels. <http://cdiacornl.gov/trends/emis/glo.html> Lianhong

Q Trying to find if there is an information network available to get real-time atmospheric CO₂ data in various areas of the US. My hope is this info is available and can be accessed through the web. (1/9/09)

A Dear Jerry Ludwig, We appreciate your question to the CDIA Web site. This is the best thing we know of related to your question <http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/download.html>. Sincerely, Dale Kaiser, CDIA Question: Trying to find if there is an information network available to get real-time atmospheric CO₂ data in various areas of the US. My hope is this info is available and can be accessed through the web.

Q Hi, Your sheet on Preliminary 2006 - 2007 global and national estimates of CO₂ fossil fuel emissions states "thousand metric tons of carbon". This is slightly confusing as the portion of carbon in CO₂ is only approx. 27.27%, although I'm sure you mean CO₂, there is actually approx. 72% of oxygen in those figures as well. What I'm getting at is that saying it is "tons of carbon" is misleading unless you are only measuring the carbon in the CO₂ emissions. Thank you. (1/8/09)

A Dear Morris, We appreciate your comment to the CDIA Web site. Our fossil fuel estimates are reported in units of carbon, not CO₂. If you wish to convert, simply multiply our values by 3.667 (i.e., the difference in the molecular weight between carbon dioxide

[44] and carbon

[12]). Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q Why carbon dioxide makes up 0.3% of the atmosphere why is it a concern? (1/8/09)

A It has to do with the fact that CO₂ is very opaque compared to other gases in the atmosphere – that is, it's a very strong absorber of infrared (heat) radiation. So, changes from a few percent to several 10s of percent (the amount of increase since the start of the industrial age) are very significant. http://www.ucar.edu/learn/1_3_1.htm

Q >> Hello, My name is Andrés Baena >> First of all, I want to thank you for all the data that is stored in >> cdiacornl.gov. It has been so useful to complete my degree thesis. >>> I want to ask: ¿What is the proportion of transport/industry carbon >> dioxide emission? >>> Thanks very much. (1/8/09)

A > hello >> Very glad to hear that CDIA has been useful to you. >> Regarding your question, go to www.eia.doe.gov, click on the "C" in A-Z > Topics and look under "Carbon Dioxide Emissions (U.S., Census Division, & International)". This will give you sectoral emission data. >> Dale Kaiser > CDIA

Q Hello, I'm working on an online module on climate change and I ran across a graphic that plots CO₂ emissions and concentrations from CDIA data (<http://www.eia.doe.gov/oiaf/1605/ggcebrq/chapter1.html>, fig. 1). I'd like to recreate the graph, and I found the data for the CO₂ emissions on the CDIA website but I don't know where to find the CO₂ concentrations. Can you help me? Thanks, Vickie Johnson, Cooperative Program for Operational Meteorology Education and Training (COMET) (1/4/09)

A Try: <http://cdiacornl.gov/trends/CO2/sio-mlo.html> TJ Blasing

Q I heard that just the eruption of Mt Saint Helens a few years back released more CO₂ into the atmosphere than all the other man induced emissions combined? Not counting the other active volcanos (1/4/09)

A Dear Mr. Branson The message you posted to the CDIAC web site was forwarded to me. I used to measure and study volcanic emissions to the atmosphere but do not do so regularly now. To help you with your question I took the following from a United States Geological Survey (USGS) website (<http://volcanoes.usgs.gov/hazards/gas/index.php>): "Volcanoes release more than 130 million tonnes of CO₂ into the atmosphere every year." For 2005, the latest year for which CDIAC has concluded their calculations anthropogenic activities released 29,278 million tonnes of CO₂ from fossil fuel activities (this does not include other anthropogenic CO₂ sources to the atmosphere such as land use change) (http://cdiac.ornl.gov/ftp/ndp030/global.1751_2005.ems). I have converted this emission mass from tonnes C, as reported on the CDIAC website, to tonnes CO₂ as reported on the USGS web page so that the comparison is on an equal basis. It is clear that the anthropogenic release is much greater (about 225 times greater) than the volcanic release. Looking back through the results of the CDIAC calculations in the year 1842 anthropogenic activities released approximately 130 million tonnes of CO₂ from fossil fuel activities (same conversion factors applied); this is equal to the USGS supplied value. I am not sure where you heard your volcano information from and so therefore can not comment on it directly. Volcanoes are not relatively constant emitters of gases and there is much variability from year to year in both terms of emissions from one volcano and the sum of all volcanoes globally. It is theoretically possible that volcanic activity could emit more CO₂ to the atmosphere than anthropogenic activities in a given year. I am not aware of any measurements that actually show this to be true during the last 160 or so years. Prior to the Industrial Revolution, volcanic activity did contribute more CO₂ to the atmosphere than fossil fuel consumption. In closing, I would like to add that while the absolute concentration of CO₂ in the atmosphere is important, the relative concentration of CO₂ in the atmosphere is also important. The absolute concentration has a lot to do with determining the average global temperature. The relative concentration has a lot to do with how quickly those average temperatures change. CO₂ has many sources and sinks, both natural and anthropogenic. The natural cycle of CO₂ into and out of the atmosphere helps regulate the average global temperature. Without that natural cycle and without any anthropogenic contribution, the average global temperature would be about -2 degrees F (this assumes no atmosphere at all around the Earth (de Nevers (1995) Air Pollution Control Engineering New York McGrawHill, p. 443.)). Clearly the natural cycle of CO₂ is important to life on this Earth as a frozen world would not be so hospitable. The major concern these days is that carbon that has been stored in the Earth over many millions of years in the form of fossil fuels is now being released to the atmosphere over a few centuries in the mode of fossil fuel consumption. There is no known compensatory process for removing that carbon from the atmosphere at similar rates as it is being released. Measurements of the concentration of carbon (or carbon dioxide) in the atmosphere are in agreement with the sudden addition of CO₂ to the atmosphere from the consumption of fossil fuels with no compensatory process. The effects of this relative increase in atmospheric CO₂ concentrations are still being studied while the Earth undergoes this actual experiment. The final outcome is not known with certainty, but a warmer world with changing precipitation patterns is most likely. The consequences for human society are even less certain. I hope this answers your volcanic CO₂ emission rate question and why it is such an important inquiry. Sincerely, Robert Andres

Q Dear Eric V. Weil, We appreciate your question to the CDIAC Web site. There are several places to get info. on snowfall 1) CDIAC has daily data from the US Historical Climatology Network. Start with: <http://cdiac.ornl.gov/epubs/ndp/ushcn/newushcn.html> click on daily data and keep clicking through 'til you get to NY's state map: http://cdiac.ornl.gov/epubs/ndp/ushcn/state_NY.html Looks like we at least have data for Scarsdale 2) NCDC's snow climatology main page: <http://www.ncdc.noaa.gov/ussc/index.jsp> 3) go to www.ncdc.noaa.gov and click on "Find a Station". You can then drill down and see stations in NY and download those that happen to have snowfall data. Sincerely, Dale Kaiser CDIAC (12/30/08)

A Dear Eric V. Weil, We appreciate your question to the CDIAC Web site. There are several places to get info. on snowfall 1) CDIAC has daily data from the US Historical Climatology Network. Start with: <http://cdiac.ornl.gov/epubs/ndp/ushcn/newushcn.html> click on daily data and keep clicking through 'til you get to NY's state map: http://cdiac.ornl.gov/epubs/ndp/ushcn/state_NY.html Looks like we at least have data for Scarsdale 2) NCDC's snow climatology main page: <http://www.ncdc.noaa.gov/ussc/index.jsp> 3) go to www.ncdc.noaa.gov and click on "Find a Station". You can then drill down and see stations in NY and download those that happen to have snowfall data. Sincerely, Dale Kaiser CDIAC

Q Could you tell me approximately how many tons of carbon have been emitted by coal (and by coal based electricity generation if you have the number) since approximately 1850. Thanks (12/29/08)

A David, if you go to our web site <http://cdiac.ornl.gov>, and click on "fossil fuel CO₂ emissions" at the bottom right of the page, it will lead you to global historical emissions, a file that gives data by fuel back to 1751. Unfortunately it does not separate total emissions from coal so that you can tell how much came from electric power generation. Let me know if you have trouble finding or using this data set. Gregg

Q I would like to know if you can direct me to or supply me with data showing the amount of snowfall in Westchester County, New York, during the 1960s? I was in High School and am writing about that time. Any help you can extend will be most appreciated (12/24/08)

A Dear Eric V. Weil, We appreciate your question to the CDIAC Web site. There are several places to get info. on snowfall 1) CDIAC has daily data from the US Historical Climatology Network. Start with: <http://cdiac.ornl.gov/epubs/ndp/ushcn/newushcn.html> click on daily data and keep clicking through 'til you get to NY's state map: http://cdiac.ornl.gov/epubs/ndp/ushcn/state_NY.html Looks like we at least have data for Scarsdale 2) NCDC's snow climatology main page: <http://www.ncdc.noaa.gov/ussc/index.jsp> 3) go to www.ncdc.noaa.gov and click on "Find a Station". You can then drill down and see

stations in NY and download those that happen to have snowfall data. Sincerely, Dale Kaiser CDIAC

Q Do you know how much the atmospheric CO₂ weighs? It's easy to calculate and amounts to 5x(10)¹⁵ pounds. Our annual production amounts to less than a tenth of a percent of this amount. The question is: how could such a minute addition have an appreciable effect? The global warmers will not tackle this question (12/23/08)

A Robert: It depends on what time scale you think is important. If you ask: (1) How much CO₂ is in the atmosphere now? and (2) How much CO₂ was in the atmosphere at the beginning of the industrial age. The answers are 380 ppmv and 280 ppmv, roughly. 380/280 is about 1.36, or an increase of 36% over the preindustrial amount. Per year, this doesn't amount to much, but if you're thinking on time scales of 50-100 years, it does. TJ Blasing

Q A friend of mine, Liza Sperling, Program Manager for the Energy-Free Home Challenge division of the Siebel Foundation, recently asked me if I knew the average amount of CO₂ that a U.S. home emits annually. Would you happen to have that statistic handy? Thanks and best regards -- Eric (12/22/08)

A Eric: To make that calculation you would have to specify whether you want to include electricity. Fossil carbon to generate electricity is not emitted from the home but is emitted from the power plant that supplies electricity to the home. If you choose to include electricity, it gets a little more complicated and the amount of emitted carbon goes way up. So, it makes a big difference. For your purpose, I would include electricity since that is likely the biggest contributor. The national totals can be closely approximated from statistics given by the Department of Energy. http://www.eia.doe.gov/oiaf/aeo/supplement/suptab_10.xls These values are energy in units of quads, carbon coefficients (Tg-Carbon/quad) are found in http://www.epa.gov/climatechange/emissions/downloads/08_Annex_2.pdf. Divide by the total number of homes to get the non-electricity part. Electricity is about 185 g-carbon/kWh. Knowing the average number of kWh/home will give you the answer. This includes carbon from wasted energy that goes out the stack, and T+D losses. TJ Blasing

[from Gregg Marland] Eric, I do not have this statistic, but I guess it might not be too difficult to make a rough estimate, depending on exactly what question you have in mind. We could look up the emissions from the residential sector and the number of homes. But I can tell you that an answer will depend very much on exactly how you frame the question. Most of household-related emissions are from electricity generation and are emitted at power plants and not technically from homes. The only real emissions from homes in the US are basically from those with gas appliances or oil heating systems. By home do you mean single-family house or do you mean something more akin to "residence"? The US EPA publishes an annual inventory of CO₂ emissions in which you can find some bits and pieces of what you are looking for. I am not so familiar with the data on number of residences but feel pretty sure we could find these numbers in census bureau data. Merry Christmas! Gregg Marland

Q > To Whom It May Concern: >>> My name is Shana Kane, and I am an intern at Shive-Hattery, Inc. We are > working on a project that is in need of the rainfall data of Hampton > IL. Hampton is located near Lock and Dam 15. Your website mentioned > that you would be able to send us the information of Hampton's daily > rainfall. If possible, we would need the information going back 5 > years. Thank you for your time and have a wonderful holiday >>> Shana Kane (12/22/08)

A Shana: Based upon what's on the website of my group (cdiacornl.gov), I'm not exactly sure where "Your website mentioned that you would be able to send us the information of Hampton's daily rainfall" comes from, but the closest thing I can readily come up with would be data from Moline, available from the National Climatic Data Center website <http://www4.ncdc.noaa.gov/cgi-win/wcgi.dll?wwDI~StnSrch~StnID~20005883>. This station would be much closer to Hampton than any of the stations in our USHCN daily data that we distribute from CDIAC. NCDC has far more station data than is available from us here at CDIAC, and it will always be as up to date as possible. If you have any problems with downloading the data from NCDC, I could help walk you through it. Good luck, Dale Kaiser CDIAC 865-241-4849

Q Hi: I work at Goddard Institute for Space Studies and am working on a NY State Climate Change Project. Initially, I had downloaded some data from the Global Summary of the Day data for Elmira, NY. Then just to see if there was any difference, I downloaded some data from this USHCN site. I was amazed at how different these values are from one another. I am enclosing a small sample of data just to illustrate this. I don't understand how these temperatures can be so different than one another at times. The precipitation showed similar differences as well, at times. Any ideas??? I am not sure which to believe???? Regards, Richie Goldberg
Hi Dale: The USHCN data was gotten from the following website, in which I selected the plain temperature, tmax, tmin, and precip. http://cdiacornl.gov/cgi-bin/broke?_PROGRAM=prog.climsitesas&_SERVICE=default&id=302610. For the Elmira summary of the day data I downloaded it from the NCDC website for the Corning regional Airport station <http://www7.ncdc.noaa.gov/CDO/cdosubqueryrouter.cmd>. Richie (12/22/08)

A Richie: The Elmira co-op station data (station 302610, 42° 06'N / 76° 50'W) should indeed look quite different at times from the Corning airport station (42° 10'N / 76° 54'W). Just looking at lats/lons, they must be on the order of 5 mi. away from each other. Airport stations in general can run warmer than often more rural co-op sites. Add to that different instrumentation, exposure, site characteristics, etc. and you can see significant differences. And of course rainfall over 5 mi. or so can differ greatly. So, I'm not surprised. Have I missed something here? You indeed are looking at data from 2 different locations, right? Dale

Q website mentioned that you would be able to send us the information of Hampton's daily rainfall. If possible, we would need the information going back 5 years. Thank you for your time and have a wonderful holiday. Shana Kane (12/21/08)

A Shana: Based upon what's on the website of my group (cdiacornl.gov), I'm not exactly sure where "Your website mentioned that you would be able to send us the information of Hampton's daily rainfall" comes from, but the closest thing I can readily come up with would be data from Moline, available from the National Climatic Data Center website <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwDI-StnSrch-StnID-20005883>. This station would be much closer to Hampton than any of the stations in our USHCN daily data that we distribute from CDIAC. NCDC has far more station data than is available from us here at CDIAC, and it will always be as up to date as possible. If you have any problems with downloading the data from NCDC, I could help walk you through it. Good luck, Dale Kaiser, CDIAC 865-241-4849

Q > Question > I recently saw your 40+ year climatological monthly mean sea level > pressures for San Francisco on your SAN FRANCISCO INT web site. Is it > possible for me to access the actual monthly values that went into creating > that climatology? Thank you. > Sincerely > Larry Breaker (12/17/08)

A Larry, could you be a bit more specific as to what dataset/link you were > referring to on our site? >> Also, after you tell me this, I suspect I can point you to a better dataset > and answer your questions >> Thanks >> Dale Kaiser > CDIAC

The monthly data are attached from our dataset on our site <http://cdiacornl.gov/epubs/ndp/ndp041/ndp041.html>. The format is 1-10 sta id 11-14 year 15-19 January 20-24 February etc. Dale

Q Do you have a listing of Sovereign Countries by Carbon Dioxide Emissions due to human activity? It's data collected by CDIAC for the United Nations. The data considers only carbon dioxide emissions via the burning of fossil fuels. Thanks (12/17/08)

A Dear Jimmy, There are two major sources of carbon to the atmosphere from human activities - from fossil fuel use and from land-use changes (e.g., converting a pasture to agricultural land). We have national estimates for both at http://cdiacornl.gov/trends/emis/tre_coun.html <http://cdiacornl.gov/trends/landuse/houghton/houghton.html>. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q Dear Sir/Md, I am doing my PhD at Technical University Vienna. I need your help. Please provide me answer of following question: How much additional CO₂ enters the atmosphere? How does this relate to the observed increase in CO₂ - do emissions explain this increase? I have already seen data for CO₂ emission and Concentration from your website and according to me annual emissions since 1961 to date only falls in ppb whereas average Conc. since 1961 is 1,43 ppm? Thanking you in advance (12/16/08)

A Dear Azam: Prior to around year 1900, Atmospheric CO₂ seems to have been in balance (CO₂ input = CO₂ removed) at around 280 ppmv. At that point it went out of balance and began increasing. The amount of increase is currently around 4 Pg-C/year (= about 2 ppmv per year) and the rate of increase has been increasing following anthropogenic CO₂ inputs. Anthropogenic input, counting land-use change, is currently around 10 Pg-C/year, so the oceans and terrestrial biosphere are absorbing the equivalent of more than half the anthropogenic input (in addition to their "natural" amounts). Sometimes the figure of one half is given, and that is accurate if one counts only fossil carbon input (about 8.5 Pg-C), and not land-use change (about 1.5 Pg-C) as the total anthropogenic input. I hope this helps you. TJ Blasing

[more] The conversion factor is: 1 ppmv CO₂ over the entire atmosphere (including stratosphere) = about 2.13 Pg-C (as CO₂) = about 7.810 Pg-CO₂. TJ Blasing

Q Hello, I'm a planner for the Town of Clarkdale, AZ. I'm doing some research on CO₂ effects on the atmosphere and what we can do as a community to reduce our carbon footprint. One of the questions that our committee has asked is "what is the current concentration of CO₂ in the atmosphere?" Where would I find this out? Also, where would I locate a chart (?) that would tell me how much CO₂ is produced by a 60 watt light bulb or an SUV - I guess what I'm looking for is stats. Any help or direction you can provide would be greatly appreciated. Thank you. (12/16/08)

A Dear Normalinda Zuniga, Synchronize your traffic lights. That would be convenient, reduce gasoline use, and save = 8.69 kg-CO₂ per gallon (an EPA site gets slightly higher, I think they assume 100.00 percent perfect combustion efficiency). That would also reduce carbon monoxide, an EPA criteria pollutant, which will eventually become carbon dioxide anyway. We usually express things in terms of carbon. When the carbon is present in the atmosphere as carbon dioxide, we can multiply the mass of carbon by 3.667 to get the mass of CO₂. This is sometimes confusing, so be aware of whether carbon or carbon dioxide is specified. Electricity generation uses about 1.5 lbs of CO₂ per kWh delivered to your coffee pot. The conversions given on the EPA sites are usually approximate because they are national averages. However, they are a good start. You are probably already familiar with this site, but just in case ... <http://www.epa.gov/climatechange/wycd/stateandlocalgov/index.html>. Sincerely, TJ Blasing

Q There is an information overload on carbon emissions I hear and read, x number of tons are saved, x number of tons are emitted. For instance, Alberta and Saskatchewan produce 40% of Canada's total emissions. What electronic or mechanical

instrumentis used to measure any particular industry's carbon emissions? What is Canada's annual carbon emission and where are the measuring devices installed? (12/15/08)

A Dear Robert Cathers We appreciate your question to the CDIAC Web site. Fossil carbon emissions are calculated from the amount of fossil fuel combusted. Atmospheric concentrations are measured by measuring their "greenhouse" effect (absorption) at particular wavelengths of radiation. For example, you can calculate your annual carbon footprint from gasoline combustion by measuring the amount of gasoline you use and multiplying by 2.37 kg-C/gallon or 0.627 kg-C/liter. To convert from carbon to carbon dioxide, multiply by 3.667; that is 8.68 kg of CO₂ per gallon of gasoline. Several factors may lead to high emissions and active oil industry is one of them, explaining Alberta's high emissions. Sincerely, TJ Blasing

Q I have a question on 'A Comprehensive Precipitation Data Set for Global Land Areas' named TR051. This precipitation data is archived as anomalies. Please let me know the base period. Is it 1961-1990? As far as I read the related document (tr051.des), I could not find the base period. Your cooperation will be greatly appreciated for my study. I am looking forward to hearing from you soon. Sincerely Yours (12/13/08)

A Dear Hiroshi MATSUYAMA We appreciate your question to the CDIAC Web site. Sorry that you could not find this information online. That was an oversight on our part because this dataset is from the era when all datasets were distributed with paper documentation. When the documentation was written, nothing was being distributed on the internet. The base period is 1951-1970, chosen because this period contains the greatest number of available stations. I hope you find the dataset useful, but I would highly recommend that you consider the use of this more modern dataset: <http://www.ncdc.noaa.gov/oa/climate/research/ghcn/ghcngrid-prcp.html>. Sincerely, Dale Kaiser ----- Question: I have a question on 'A Comprehensive Precipitation Data Set for Global Land Areas' named TR051. This precipitation data is archived as anomalies. Please let me know the base period. Is it 1961-1990? As far as I read the related document (tr051.des), I could not find the base period. Your cooperation will be greatly appreciated for my study. I am looking forward to hearing from you soon. Sincerely Yours COUNTRY OF ORIGIN JAPAN

Q Dear Sir / Madam, I found your time series on Fossil-Fuel CO₂ Emissions entitled Global CO₂ Emissions from Fossil-Fuel Burning. I have two questions since the description seems unclear. First: You wrote this is Cement Manufacture and Gas Flaring 1751-2005. Are these series therefore only from cement manufacturing or global CO₂ emissions from the burning of Fossil Fuels given any production activity? Second: You wrote something about Per capita emission estimates. Are the now total global emissions or per capita emissions? Thank you sincerely for clarifying these points. With kind regards, Ingmar Schumacher (12/11/08)

A Ingmar, All of these values are in our tables. If you look closely at the column headings you will find emissions numbers from burning coal, oil, natural gas, flaring gas, manufacturing cement, and the sum of all of these. They are all there. Per capita numbers are also given for each country and each year.

Q Can table and graphs images be reproduced in school texts. What is your copyright policy (12/7/08)

A Dear Kelly, You have our permission to reproduce any of the materials found on the CDIAC web site including graphics for educational purposes. We do ask that you use the recommended citation given for most products and presentations. If you are uncertain how to properly cite material you intend to use or reproduce, please contact me. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q I hope you find this resource useful www.LowCarbonEconomy.com Accelerating the transition to a Low Carbon Economy and empowering people, organisations, companies and governments to make informed choices (12/2/08)

A Dear Paul, We appreciate your comment to the CDIAC Web site. We may indeed find the resource useful as may our users. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am doing a research on climate change and use the data you're publishing however, I was unable to find the following data (which I'm almost sure you have): 1. annual average concentration of CO₂, CH₄ and N₂O, for the years 1860-2008 (not smoothed, and not the moving average) 2. annual average of solar irradiance for the years 1860-2008 3. annual average of CRF (cosmic ray flux), for the years 1860-2008 thank you very much for your help. Yaniv (12/1/08)

A Dear Yaniv Reingewertz We appreciate your question to the CDIAC Web site. I'm afraid we have never had the data for your items 2 and 3. As for item 1, as you are probably aware, we have many types of trace gas records but I'm not sure we have all of these for the period requested. If not readily found on our site, the broadest and most up to date records for all 3 species would probably be NOAA's Earth System Research Laboratory Global Monitoring Division. <http://www.esrl.noaa.gov/gmd/> Sincerely, Dale Kaiser ----- I am doing a research on climate change and use the data you're publishing however, I was unable to find the following data (which I'm almost sure you have): 1. annual average concentration of CO₂, CH₄ and N₂O, for the years 1860-2008 (not smoothed, and not the moving average) 2. annual average of solar irradiance for the years 1860-2008 3. annual average of CRF

(cosmic ray flux), for the years 1860-2008 thank you very much for your help Yaniv

Q As a rheumatologist interested in iodine deficiency and thus the status of the kelp forests in that respect the global warming is threatening these kelp forests and thus our iodine supply in the long run and thus live itself in medical science one uses a carbon dioxide challenge test for sensitivity to panic disorders and anxiety. It is done with a 35% CO₂ challenge. Knowing that a short period of time in this situation can induce anxiety the most logical question is whether a longer stay in a milder environment will induce anxiety as well. This latter is the case in the carbon dioxide rising world wide. Is it influencing our behaviour in a negative way and could it be an explanation for the increasing anxiety levels worldwide? Since nobody is looking into this I hope you will have the contacts to start this line of research. This could mean a direct linking between CO₂ problems and human behaviour so far one thinks that the pH level is the trigger but this is an assumption, it could be the CO₂ itself as well. It could be reflected by the anxiety levels in society during the winter period of the northern hemisphere compared to the summer period worldwide. I really don't know if there is a difference between these two periods in anxiety, criminality and so on. (12/1/08)

A Dear Richard, Thank you for your comment to the CDIAC web site. I too hope future research involves human health effects related to increased levels of carbon dioxide and artifacts of climate change like your kelp forest example. The truth is only recently, circa 2007, did the world finally accept the greenhouse gas induced climate change theory. Research to date has been aimed primarily at understanding the carbon cycle and climate system - and there is still much to learn (e.g., aerosol feedbacks, complex interactions between C-N-P-H₂O cycles) - so climate change research is only now beginning significant research on mitigation and adaptation including human health issues. I sincerely hope this type of research will prosper in the future. Thanks again for your e-mail. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q IS THERE A LIST OF CO₂ EMISSIONS AS GLOBAL PERCENTAGES FOR ALL COUNTRIES? NOT INTERESTED IN "PER CAPITA" FUDGES... WANT THE CURRENT BEST PER-COUNTRY EMISSIONS (12/1/08)

A The specific file that you enquire about does not exist, but it should be easy to generate. You have on our web site the list of emissions from all countries. All you need to do is divide the emissions from each country of interest by the sum of emissions for all countries. For a variety of reasons that I can explain if you like, the sum of emissions from all countries is not equal to the total global emissions number. (The most important reason is that the country numbers do not include emissions from fuels used in international commerce while the global total of emissions does include these emissions). What you need then, is the sum of emissions from all countries. These numbers do not appear anywhere on our web site at present, but I will send them to you in a separate e-mail. In the file attached to that e-mail you will find that for each year the first column of numbers gives the sum of emissions from all countries. Let me know if you have questions. Gregg

[from Tom Boden] Dear Richard, The attached file provides the percentage of the 2005 global carbon emissions from fossil fuel use and cement production, calculated using the sum of the individual countries (7.549 billion tons C for 2005), for each country listed in descending order based on their 2005 total fossil fuel emissions. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Could you please advise me what are the contributory materials in calculating the carbon foot print of a building and their CO₂ contribution in a building project? (11/30/08)

A Hello. The answer to your question depends on what materials are used and how far they are transported by vehicles using fossil fuels for propulsion. The following material gives some material about materials: <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>. I am also attaching a couple of papers about cement production. TJ Blasing (Terence J.) TJ Blasing Carbon Dioxide Information Analysis Center Building 1509 Oak Ridge National Laboratory Oak Ridge, TN 37831-6335 ----- Ph: (865) 574-7368 FAX: (865-574-2232) E-mail: blasingtj@ornl.gov

Q numerous links on your site re results of CO₂ atmospheric sampling at the stations around the globe are not active and return a "file not found" response (11/25/08)

A Dear William, Thanks so much for taking the time to call our attention to some of these broken links. Our web site is in transition so hopefully these links will be fixed very soon. Thanks again for your comment. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Nov 23, 2008 cdiacservices Domain name & Internet keyword Dear Sir/Madam, We are Hong Kong Network Service Company Limited which is the domain name register center in Asia. We received a formal application from a company who is applying to register "cdiacservices" as their domain name and Internet keyword on Nov 22, 2008. Because this involves your company name or trade mark so we inform you in no time. If you consider these domain names and internet keyword are important to you and it is necessary to protect them by registering them first, contact us soon. Kind Regards, Alf.Zheng (11/23/08)

A Dear Alf, Thank you for your notification of someone trying to register the domain "cdiacservices". We are U.S. government sponsored and all our information is available freely to anyone. Although I find it a bit disheartening that someone wishes to benefit by serving as a portal to our center and our work, there is nothing to prevent them from doing so and we do not wish to

register all the countless possible CDIAAC domains Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q I am trying to save lives. This research is absolutely fascinating. It is understanding and mapping the changing climate. In order to do this I had to find out exactly what is happening. The atmosphere is slowing down. While doing other research into densities I found an oceanographer (Ruth Curry) who is measuring the salinity changes in the ocean. This ocean surface salinity change started in 1967 and has spread over the years. In the last five years, the oceans have slightly cooled. This salinity covers most of the warmer waters. Through intensive research in this area, I have gained a great deal of knowledge of exactly what is happening here. Salt has a crystalline composition that can reflect solar heat. Water's natural state is vapour but is trapped by gravity and atmospheric pressure which keeps it in water form. What releases and pulls gases and water vapour is centrifugal force. Our atmosphere is not attached to the planet so it rotates slower than the planet. It essentially pulls the gases and water vapour. The collision of water vapour together creates water droplets that is pulled by gravity when the wind and centrifugal force is not carrying it. Our atmosphere is also slowing down due to the dense matter accumulating in the atmosphere causing friction against gravity. H₂O is water found every Ice Age. This is one of 3 waters we have on the planet and has leached out of the glaciers and is currently pooling on the ocean floor. The gases we have put into the atmosphere have density which has a greater pull on the planet from centrifugal force. This has brought the salt to the surface. Gravity does not change BUT the speed of our atmosphere can and does through matter densities. In the past, many Ice Ages were activated through great meteor crashes or volcanic activity. Man has precipitated this with great volumes of matter into the atmosphere. When the atmosphere slows, centrifugal force increases. I believe we are in for a great deal of precipitation with a cooling over an extended time period as the heat stored in the atmosphere will travel over the protected water to the cooler areas to intensify evaporation. This is trying to cool down the overheated planet. I would like a partner/sponsorship to continue. Items such as shape and distance of atmosphere from the planet's surface is significant in heat and cooling trends with an atmospheric slowdown. Thank you, Joe Lalonde 10 Glen Cedar Drive, Penetanguishen, On, Canada Phone 1-705-533-3915 (11/23/08)

A Dear Joe, Thank you for your recent e-mail to the Carbon Dioxide Information Analysis Center (CDIAC). Interesting work, however, the CDIAC is not a funding source for outside research. I hope you are successful in finding a sponsor or partner and best wishes in your future research. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q I notice that the online data is from 2005. Is there anything more current available? (11/20/08)

A Dear Char, We have just received the 2006 energy statistics from the United Nations so we hope to have fossil-fuel emission estimates through 2006 available early in 2009. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov

Q We just did a lab on CO₂ levels in the atmosphere. For one part of the lab, we used your data from 1750... how did you get this data? How do you know it is correct? Many thanks, Eliza (11/17/08)

A Eliza, Good question on how we determined CO₂ emissions back to the 1750s. For the years 1950 to present, we rely upon surveys conducted by the United Nations in which individual nations account for fossil fuel production and consumption across many categories. The results of these surveys are cross-checked against industry and other reports. For the years prior to 1950, we do not rely on the United Nations' survey as they did not exist for this time period. Instead, we rely upon tax records kept by various governments. Fossil fuels are a commonly taxed commodity when they are produced, traded, and sold. There is some cross-checking of the data produced by these records with other sources also. Regardless of the source of the data, whether United Nations' survey or tax records, these original data give the amount of fossil fuels produced or consumed in mass or volume units. We then combine this information with some knowledge on the chemistry of fuels to calculate the amount of carbon released by the given amount of fuel (i.e., carbon content) under typical burning conditions (i.e., fraction oxidized). Of course we keep track of proper unit accounting throughout the whole process. Thanks again for your question. Sincerely, Robert Andres

Q Mr. Zhou, Our expert is on travel and will contact you next week about your request. Please do not hesitate to contact our User Services Office should you have any further questions. Sincerely, Lee Ann Hughes

User Services Office Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC) Environmental Sciences Division Oak Ridge, TN 37831-6407 Telephone +1 (865) 241-3952 Fax +1 (865) 241-3685 E-mail: usc@daac.ornl.gov http://www.daac.ornl.gov *****

From: zhixiangzhou [mailto:zhixiangzhou@hotmail.com] Sent: Saturday, November 08, 2008 5:30 PM To: ornl daac@ornl.gov Subject: Could you please help me out? Dear Sir/Madam, I am a student of London School of Hygiene and Tropical Medicine, UK. In a study of mine I need to investigate the meteorological conditions in Kansas during February-March 1918. I visited your website and I am happy to know that you have the data for (Historical Daily Rainfall and Temperature Data for Manhattan, Kansas). Could you please send me the data or tell me how to access them. Thanks! Month: February and March Year: 1918 Place: Manhattan, Kansas Elements: daily temperature & precipitation Your kind assistance will be

greatly appreciated I'm looking forward to hearing from you soon. Kindest regards, Steven Z. Zhou Certified Occupational Hygienist(USA) MSc. MPhil. BSc. Email: epidemiologyzhixiang@hotmail.com Tel: 1.604.456.8042 (11/17/08)

A Steven, The closest data for this month/year that I could find (that had all the variables you are interested in) was Trenton, NJ. I downloaded them from NCDC through a great interface they have. The whole process starts with going to www.ncdc.noaa.gov and clicking on the "Find a Station" link. It was just as fast for me to get the data myself and attach the files to this email as it would've been to lead you through the process of downloading from NCDC, but I would encourage you to try it yourself. I got these data from the NCDC website for 2 reasons: 1) our data here at CDIAC did not have a station really close to Fort Dix, and 2) our data here is only temp, precip, snow, not the other variables you were interested in. Hope you find the attached files useful.
Dale

Q Dear Sirs! I would like to know if it would be ok to get some land in Canada by a lake like canoe lake in Nova Scotia or will it disappear in no time? How high above sea level (in meters) would have to be a piece of land in order to keep the value and the place? Thank you very much in advance for your reply! Ulrika (11/15/08)

A Dear Ulrika, We appreciate your question to the CDIAC Web site. I'm afraid your question about if it's wise to buy land in a particular region is beyond our purview and expertise. Sincerely, Dale Kaiser

Q Dear Sir or Madam, I am writing to request for information on the "Total CO₂ emissions generated by the U.S. steel industry in 2007". I am currently conducting a research on the Steel Industry and its CO₂ Emissions with the U.S. being my reference country. I would very much appreciate it if you would consider my request. I am looking forward to hearing from you. Yours faithfully, Delphine T. Takere (11/13/08)

A The attached only goes through 2006, but you still may find it helpful. If you need preliminary 2007 data, I might be able to give you the name of someone who can help. TJ Blasing ++++++ (Terence J.) TJ Blasing Carbon Dioxide Information Analysis Center Building 1509 Oak Ridge National Laboratory Oak Ridge, TN 37831-6335
----- Ph: (865) 574-7368 FAX: (865-574-2232) E-mail: blasingt@ornl.gov -----

Q The Wall Street Journal, Nov. 6, 2008, at A12 shows worldwide carbon emissions around 8 billion metric tons for 2005-07. Yet EIA -- annual energy review for 2007 -- shows that worldwide CO₂ emissions for 2005 about 28 billion MT. (See Table 11.19 of their report). Why is there such a large difference in the values? (11/13/08)

A EIA reports the mass of carbon dioxide, the Wall Street Journal reports the mass of carbon in the carbon dioxide. Carbon dioxide has a molecular mass of 44, C has an atomic mass of 12, so the ratio of the two numbers should be 44 divided by 12 = 3.667. Both numbers are logical and correct, but it can certainly be confusing to some readers.

Q When do you expect that more recent (up to 2006 or 2007) regional data on carbon emissions will be available? Also, what percentage of emissions (using the most recent data available) comes from industrialized nations versus developing nations? (Or where might I look to find this information myself?) Thank you. (11/12/08)

A Dear Alexandra, We appreciate your question to the CDIAC Web site. We have just received the latest version of the United Nations energy statistics database (UNSTAT) which contains data through 2006. Typically, it takes us several months to sort out details and data issues so we expect to finalize the 2006 emission estimates in early 2009. It's about 50-50 now as far as industrial emissions from industrialized versus developing countries. Please see <http://cdiac.ornl.gov/trends/emis/annex.html>. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

[from Gregg Marland] Alexandra, On our web site, the primary data file has all country emissions data through 2005. These estimates are based on energy data from the United Nations. I assume that you also found our file of preliminary data for 2006 and 2007. These are derived by using energy data from BP to extrapolate our primary time series. The regional data are computed from the UN data through 2005 but we have not added the 2006 and 2007 values - which could easily be done. We probably will not add up the regional sums until we have the full UN energy data and these typically are not available for 2 1/2 years after the end of a year. It takes the UN that long to compile all of the national energy data. The bottom line here is that we probably will not tabulate the 2007 regional data for another 1 1/2 years, but you should be able to take our preliminary values and add up the 2006 and 2007 regional sums. The 2006 and 2007 data are in an Excel file so this should be pretty straightforward. Regarding your second question, I have added up the sums for developing countries vs. developed countries for 1992 to 2007. The challenge of course is how do you define developed vs. developing. I took the Kyoto Protocol separation of Annex B countries (developed) vs. non-Annex B (developing). If this would be useful to you, I can send you that spreadsheet. This time series starts in 1992 because the break up of the USSR resulted in some parts of the USSR being included in Annex B and some not, and it is very hard to sort these out to carry the time series back into when the USSR is the only of those countries in the energy data set. I hope that this all makes some sense. If not, let me know. Also, let me know if the Annex B/non-Annex B separation is useful to you. Cheers, Gregg

Q Hello, Surfing this website, I have found CO₂ emission levels from for the past 100 years. This was found under the "Subject Areas Fossil Fuel CO₂ Emissions" link. I am looking for corresponding atmospheric temperature data, specifically for Canada. Can you please direct me to where I can find this information? (11/12/08)

A Dear Faisal, We appreciate your question to the CDIAAC Web site. I suggest the following locations on our site for long-term Canadian atmospheric temperature records: <http://cdiac.ornl.gov/epubs/ndp/ndp041/ndp041.html> <http://cdiac.ornl.gov/trends/temp/lugina/luginah.html> http://cdiac.ornl.gov/climate/temp/temp_table.html Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 U.S.A. bodenta@ornl.gov

Q From: zhixiangzhou >> [mailto:epidemiologyzhixiang@hotmail.com] >> Sent: Saturday, November 08, >> 2008 5:30 PM >> To: ornldaa@ornl.gov >> Subject: Could you please help me >> out? >>>>> Dear Sir/Madam >>> I am a student of London School of >> Hygiene and Tropical Medicine UK. >>> In a study of mine I need to >> investigate the meteorological conditions >> in Kansas during February- >> March 1918 >>> I visited your website and I am happy to know that you >> have the data for >> (Historical Daily Rainfall and Temperature Data for >> Manhattan, Kansas). >>> Could you please send me the data or tell me how >> to access them. Thanks >>> Month: February and March >> Year: 1918 >>> Place: Manhattan Kansas >> Elements: daily temperature & precipitation >>>>> Your kind assistance will be greatly appreciated >>> I'm looking >> forward to hearing from you soon. >>> Kindest regards >>> Steven Z. >> Zhou >> Certified Occupational Hygienist (USA) >> MSc. MPhil. BSc. >>>> Email: epidemiologyzhixiang@hotmail.com >> Tel: 1.604.456.8042 (11/8/08)

A Great, glad to hear that we could help out! You're most welcome >> Dale >> On Thursday 20 November 2008 10:36 am, you wrote >> Dear Dale, >>>> Thank you very much for your reply. >>>> The links you provided are very useful. I've extracted the data that I >> need. >>>> I was a meteorologist and worked with NCAR in Colorado before I pursue a >> career in occupational health. >>>> Thank you again! >>>> Kindest regards >>>> Steven Zhou >> Date: Tue, 18 Nov 2008 15:54:36 -0500 >> From: >> kaiserdp@ornl.gov; kaiserdp@ornl.gov >> Subject: Re: Could you please help me out? / Manhattan >> KS data >> To: hugheslal@ornl.gov; cookrb@ornl.gov; kaiserdp@ornl.gov >> CC: >> epidemiologyzhixiang@hotmail.com; beatytw@ornl.gov >> Mr. Zhou, >> Please >> follow these steps to access the data you need. >> Go to: >>>> http://cdiac.ornl.gov/epubs/ndp/ushcn/state_KS.html >> Click on station >> "144972". >> Click on the "Create a download file" link. >> Use the check >> boxes to select the temp and precip variables you want. I would >> also >> recommend selecting the associated data flags in case there are any >>> problems associated with any of the observations (The meanings of any and >>> all flags can be found here >>> <http://cdiac.ornl.gov/epubs/ndp/ushcn/usa.html> - search in that page for >>> "Flag codes for the HCN/D data") >> To constrain the file to just the years >> you want, insert that info. in the >> "for this date range (mm/dd/yyyy)" >> boxes. >> When you are ready, click on "submit" and a comma-separated value >> file will be >> written for download to your computer. It should open just >> fine in Excel, >> for example >> If you have any problems/questions just >> email me at kaiserdp@ornl.gov. >> Regards >> Dale Kaiser >> CDIAAC

Q Carbon & its way to the atmosphere- Hello, I hope you can tell me how long carbon needs to reach these zones in the atmosphere where it is told to contribute to global warming. I have heard that it needs about 12 to 14 years. Thank you very much. (11/7/08)

A If the carbon is present as carbon dioxide (CO₂), Methane (CH₄) or part of a halocarbon, the answer is "as soon as it enters the atmosphere." These molecules absorb infrared radiation. TJ Blasing ++++++ (Terence J.) TJ Blasing Carbon Dioxide Information Analysis Center Building 1509 Oak Ridge National Laboratory Oak Ridge, TN 37831-6335 ----- Ph: (865) 574-7368 FAX: (865-574-2232) E-mail blasingtj@ornl.gov

Q It is now all but impossible to find the CO₂ emission numbers. If one did not know ahead of time that there were somewhere on the site one would assume they were not. They are buried too deep. There is no obvious category on the landing page to look for them, and even under climate it is a guessing game. You are the top source for CO₂ emission data for all countries in the world as well as global. Don't you think it would make sense for people to be able to find this information easily?? What do you think people go to CDIAAC for?? (11/7/08)

A Dear Naomi, Sorry for the confusion and hopefully you eventually found what you were looking for. If not, please send me an e-mail and I'll be happy to provide specific URL pointers. In good humor, I guess "Fossil Fuel CO₂ Emissions" on the landing page under the same Subject Area navigation bar where you found "Climate" wasn't obvious. Thanks for your comment. Sincerely, Tom Boden

Q Hello, My name is Mikael Bergbrant and I am a researcher at the University of South Florida (Finance Department). I am looking for historical cloud cover data for a select number of cities around the world. Do you know where I could find access to such data? Thankful, Mikael Bergbrant 813-447-6288 (11/7/08)

A Hi Mikael, I'm following up on your request to the ORNL DAAC. There are several places to get cloud cover data. Depending on the source, the extraction can be a bit tricky. Here's some possibilities - National Climatic Data Center: <http://www.ncdc.noaa.gov> click on the "find a station" link and you can search in a number of ways. Once you select a station, subsequent pages will show what variables are available. - Carbon Dioxide Information Analysis Center (my place) http://cdiac.ornl.gov/climate/clouds/clouds_table.html The 2nd row of the table (NDP-026D) might be the best for you. These are very large datasets and geared pretty much for scientists (as such the documentation and the interfaces are not trivial to deal with). - Here

is quite an easy place to get US data, but I'm afraid the time series only extend through the late 1980s and are no longer updateable due to the US changing their observing practices <http://cdiac.ornl.gov/ndps/ndp021.html> - Here are some pretty easy to handle data from China, but again, only extending through 1993: <http://cdiac.ornl.gov/epubs/ndp/ndp039/ndp039.html> Here is a study I did using some China data: <http://cdiac.ornl.gov/trends/clouds/kaiser/kaiser98.html> I hope one of these ways helps. Cloud data are not as easy to work with as temperature or precipitation. Dale Kaiser CDIAc

Q Hello, I would like to clarify how was total CO₂ emissions by country data (up to 2005) measured. I.e. was it taken from multiple sources or measured by CDIAc. Many thanks in advance (11/6/08)

A Dear Sergei, Our fossil fuel emission estimates for individual countries are based on two primary sources. First and foremost energy production and trade data published by the United Nations. Secondly cement production data published by the U.S. Geological Survey. For more details on our sources and methodology please see <http://cdiac.ornl.gov/trends/emis/overview.html>. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA bodenta@ornl.gov (865) 241 4842

Q Hello, Can you please clarify the measurement of CO₂ in your tables? In your spreadsheets and graphs displaying CO₂ emissions data you state that the measurement is Thousand metric tons of C (Carbon). Can you please confirm that this is a measurement different to Thousand metric tons of CO₂ and that it can be converted to CO₂ by multiplying your figures by 3.666667? Thank you. (11/6/08)

A Yes. Multiply your carbon emissions by 3.6667 (=44/12) to get CO₂. TJ Blasing

Q Dear Sir, dear Madam, We are working on a project for Eurostat, the Statistical Office of the European Communities to develop indicators to be used in monitoring the EU's sustainable development strategy. To get statistical data on GHG emissions is part of the strategy and it would be highly desirable to be able to monitor its evolution over time. The indicator we have to develop is "the share of global greenhouse gas emissions from countries having agreed limits on their emissions", i.e. the total GHG emissions from the 39 countries having agreed limits on their emissions ('Annex I parties') divided by the total GHG emissions in the world. The indicator should be based on UNFCCC data. We found time series for the Annex I countries but no series for the world or the rest of the world. The only estimate of global greenhouse emissions we are aware of comes from the IPCC 4th assessment report - see summary for policy makers http://www.ipcc.ch/pdf/assessmentreport/ar4/syr/ar4_syr_spm.pdf. We would like to know how global greenhouse gas emissions can be estimated taking into account that no data are available for all countries of the world. How can emissions be estimated for fast growing economies such as China and India? We would be grateful for any information you are able to offer. Thank you for your help. Yours sincerely, Gesina Dierickx Sogeti Luxembourg SA Economist 36 route de Longwy L - 8080 BERTRANGE ----- E-mail: gesina.dierickx@sogeti.lu <http://www.sogeti.lu> (11/5/08)

A Gesina, If you restrict yourself to "UNFCCC data" you are certainly correct that there are not estimates of CO₂ emissions for all countries. But you do not need to restrict yourself to UNFCCC data. The United Nations reports data on energy production and trade for all countries and the International Energy Agency has similar data for most countries. The BP company and the US Department of Energy also provided data sets on world energy production and trade and Eurostat has its own energy data that are independent of the UNFCCC data sets. We estimate CO₂ emissions for all countries based on the UN energy data set. Attached to this message you will find our recent estimates of the values that I think you are searching for. Sincerely, Gregg Marland

Q Hello, I was at a site that had a 1997 CO₂ production by Country pie chart and I was interested in using the pie chart in my research paper for an academic paper. I would be more than glad to send a copy of the chart and proper referencing. Please let me know asap. I was not aware that I had to ask permission to use search engine photos so my time is very limited. Thank you for your time and I look forward to hearing back. (11/5/08)

A Megan, I do not understand what you are asking. As you know, our web site includes data on CO₂ production by country through 2007 and these data are in the public domain for any and all users. Gregg

Q What percentage of greenhouse gas emissions are carbon dioxide - including man made and naturally occurring sources? Thank (11/3/08)

A Michael, It is going to take a little digging but I think there is enough information in the IPCC Third Assessment Report to put this together. Go to www.ipcc.ch and then the working group I report for the Third Assessment Report - chapters 3 and 4. Cheers, Gregg

Q Dear Sir, My name is Ines Rombach. I am studying in the University of Brighton and am currently in my 3rd year working on my final year project. This covers time series and forecasting and I would be interested in using the Carbon Dioxide emission data for the UK that is used on your webpage. However, the data that is available for downloading is not detailed enough for my work and I was wondering if it would be possible to obtain the monthly emission figures going back for at least 10 years to 15 years. Alternatively could you advise me on whom to contact for this information? I very much appreciate your help and am looking

forward to hearing from you. Please do not hesitate if you have any further questions on my project or other. Regards Ines Rombach (11/3/08)

A Ines, I think that the only hope of finding monthly emissions data for the UK is our colleague Bob Andres, so I am copying this note to Bob. If Bob has the data I am sure he would be glad to share it. If he does not have it, I am sure that he would be delighted to get data from you if you are successful in finding or generating the monthly time series. In either case, Bob has monthly data for some countries and I am sure that he would be interested in support of his project to learn how you are using monthly data. Good luck, Gregg Marland

[from Bob Andres] Ines, Gregg Marland copied me on his reply to you. Let me tell you what data I have and let's determine if it will be of use to you. The basic data file I could supply you would have the seven column titles column titles of: 1. Total_f is a mass-weighted fraction of the three fuels combined Its annual total equals one. Its value could change in future years as the mass of emissions are updated Masses are given for the current calculation 2. Solid_f is the monthly fraction of solid emissions Its annual total equals one. 3. Liquid_f is the monthly fraction of liquid emissions Its annual total equals one. 4. Gas_f is the monthly fraction of gas emissions Its annual total equals one. 5. Solid_m is the mass of annual solid emissions as reported by CDIAC 6. Liquid_m is the mass of annual liquid emissions as reported by CDIAC 7. Gas_m is the mass of annual gas emissions as reported by CDIAC. All masses are given in units of thousand tonnes C (missing values due to incomplete underlying data, are expressed by a period). Data are available from January 1984 to December 2002. To get monthly mass of emissions multiply the monthly fraction for a specific fuel by the CDIAC-reported annual mass of emissions for that fuel for that year. It would be helpful to me if you could reply with some details about how you want to use the data. The data we have for the U.K. are preliminary at present, and are not available to the general public. They should be available to the general public with the year. I look forward to your reply. Sincerely Bob Andres

Q > I am a graduate researcher at Georgia Tech using the GISS data for a > project I am downloading station data for urban centers (for example > Atlanta72219000&data_set=1&num_neighbors=1>) as well as three rural stations near > that urban center (for example > Talbotton25722250030&data_set=1&num_neighbors=1>, Valley > Head200030&data_set=1&num_neighbors=1>, and > Warrenton25722180030&data_set=1&num_neighbors=1>). A few years ago we downloaded the > data (through 2003) and ran some numbers. Now we are downloading the > same stations (through 2008) and finding that some of the historical data > for the stations is different. We are using the annual averages for the > stations. For example in 1950 the data that we had downloaded previously > reported the Valley Head annual average as 15.29 and the new download of > the data lists it as 14.78. >> I was hoping that you could help me understand what is going on with the > data or point me in the direction of an appropriate contact at USHCN. >> I look forward to hearing back from you and am happy to answer any > questions you have for me. >> thank you >> jason > (11/2/08)

A Hi Jason, It sounds like perhaps some QA checks may have resulted in a different set of daily values being used to compute means. That or some sort of adjustment for nonclimatic effects was instituted. Since we at CDIAC don't compile the data but maybe distribute it or point people to it, I'd advise that you contact the GISS/USHCN PIs. You are probably familiar with the home pages of these databases at GISS and NCDC, but here are a few pages I think would be good for starters: <http://www.ncdc.noaa.gov/oa/climate/research/ushcn/> <http://data.giss.nasa.gov/gistemp/> Regards, Dale Kaiser CDIAC

Q Dear Sir/Madam, I am a student from the University of Amsterdam and currently working on my Master thesis. For the thesis I am doing research on the influence of investments from multinational companies on the environment in developing countries. It is a cross-country study (all developed countries included) and I am going to study the data from 1985 to now. To investigate their influence on the Carbon Dioxide emissions in these developing countries, I started retrieving data from your website a few months ago. When I wanted to continue a few days later, the data disappeared from the website. On the website you said: "the page you're trying to reach is unavailable or may no longer exist". Now I wondered if it is possible to get that information. The data I am talking about is called: Top 20 Emitting Countries by Total Fossil-Fuel CO₂ Emissions for 2005-Digital Data (All countries in single file). I hope this is possible to realize, because it would be of great help to me. I look forward to hearing from you soon. With kind regards, Silvia van Wijk (10/30/08)

A Silvia, The correct URL for the data is: http://cdiac.ornl.gov/ftp/ndp030/nation1751_2005.ems There was a typo in the link on the Top 20 page. Thank you for alerting us to the problem. Good luck with your Master's thesis. We're sorry for any inconvenience we may have caused you. Regards, Fred

Q Hello, How can I obtain data which lead to the National CO₂ Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring annual summaries on the CDIAC national CO₂ emissions link? Particularly I am interested in business specific information. For the US, this information is available through the USEPA, but internationally how would I obtain? THANK YOU!!! (10/29/08)

A Our estimates of CO₂ emissions are based on country-level data on energy consumption as compiled by the United Nations. The International Energy Agency in Paris has some CO₂ estimates for large economic sectors for many developed countries (iea.org). As far as I am aware the kind of data you seek do not exist. Cheers, Gregg

Q I would appreciate if I can get the sea level rise for Kuwait from 1972 to 2008 or any information regarding it particularly for Kuwait Regards (10/28/08)

A Dear Saji, Please visit the web site below for projected sea level inundation in the Mediterranean region. https://www.cresis.ku.edu/research/data/sea_level_rise/h_mediterranean.html Our data center does not offer annual estimates of sea level rise for individual nations. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Help me to reconcile the following or correct my information: Industrial emissions per capita have been decreasing. Human breathing has no effect on global warming because the carbon dioxide of breathing is balanced by plant growth. I find the carbon cycle explanation of global warming seems inadequate because it does not help me to understand the kinetics of the process. It would be helpful if someone could show a carbon cycle with per capita numbers that would help me to relate the information to something tangible. Is such a source available? Whether we like it or not fossil fuels (being animal in origin) are part of the carbon cycle. Is there any carbon cycle or rate carbon cycle that incorporates all carbon sources into the mix? (10/25/08)

A On Saturday 25 October 2008 02:36 pm, you wrote > Help me to reconcile the following or correct my information > > 1. Industrial emissions per capita have been decreasing. They were sort of flat for a period, but not in recent years. See: <http://cdiac.ornl.gov/trends/emis/glo.html> > 2. Human breathing has no effect on global warming because the carbon dioxide of breathing is balanced by plant growth. Yes, this is basically a closed loop. See: <http://cdiac.ornl.gov/faq.html#Q13> > > I find the carbon cycle explanation of global warming seems inadequate > > because it does not help me to understand the kinetics of the process. It > would be helpful if someone could show a carbon cycle with per capita > numbers that would help me to relate the information to something > tangible. Is such a source available? Not that I'm aware of. One could take the basic source/sink terms from the carbon cycle and work in population if they wanted though. Our carbon cycle graphic is here: <http://cdiac.ornl.gov/faq.html#Q4> > > Whether we like it or not fossil fuels (being animal in origin) are part > > of the carbon cycle. Is there any carbon cycle or rate carbon cycle that > incorporates all carbon sources into the mix? Not sure I get what you mean. Yes, fossil fuels have their origins in mainly plant matter. The bottom line is that the carbon from these sources is being burned so many orders of magnitude faster than its initial accumulation that balance cannot be maintained. Dale Kaiser CDIAAC

Q Is there a National average CO₂ emission per mile travelled by car? (10/22/08)

A Dear Jayson Goh, It depends on your mileage, my corolla emits a lot less carbon dioxide per mile than does my brother-in-law's Belchfire V-8. 2.4 kilograms of carbon as CO₂ (=about 8.8 kilograms of CO₂ including the oxygen) per gallon of motor gasoline is very close. If you have a diesel vehicle 2.8 kg-C/gallon is closer. If you use E-85 and want to count only the fossil carbon, multiply by 0.85. We appreciate your question to the CDIAAC Web site. Sincerely, TJ Blasing

Q My question relates to the soil carbon and nitrogen data used to compile the mass of soil organic carbon and organic nitrogen per square meter as appears in Zinke et al. (1984. Worldwide Organic Soil Carbon and Nitrogen Data. ORNL/TM-8857. Oak Ridge National Laboratory, Oak Ridge, Tennessee, U.S.A.). Specifically, ORNL Report TM-8857 mentions the mass fraction of soil organic carbon (and, by implication, soil nitrogen) as the parameter CF in equation (3.4) on page 6. The soil carbon and nitrogen data listed in Appendix Table A of Report TM-8857 were computed using equation (3.4) based on mass fraction data that does not appear in the report. Does the CDIAAC have in its archival collection the mass fraction of soil organic carbon (CF, units: mass-organic carbon/mass-soil) and the mass fraction of soil organic nitrogen (units: mass-organic nitrogen/mass-soil) for each sample listed in TM-8857 (Appendix Table A. Soil Profile Data)? If so, what steps must I follow to gain access to these data? (10/20/08)

A Dear William, We appreciate your question to the CDIAAC Web site and continued interest in our data products. The soil carbon database in question is quite old and, not surprisingly, took advantage of some dated technologies (i.e., a whole cabinet of punched cards run through Fortran compiler on a mainframe computer). I forwarded your request to Mac Post, one of the original co-authors and an ORNL scientist here, and he suggested you contact lead-author Al Stangenberger (forags@nature.berkeley.edu). Al may have converted that level of data detail from a cabinet full of punched cards to a more accessible form. Sorry we couldn't provide the data directly but I would be interested to know what you learn from Al, should you contact him. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 (865) 241 4842 bodenta@ornl.gov

Q How can you convert the .dat files to a format such as Microsoft Office or OpenOffice? The tables are so rich in information that it is really a shame that they are so hard to use. Why not publish them as xls files in the first place? yours Fredrik Lundberg (10/20/08)

A Try saving it as a text file and then opening the txt file in excel. Then save it as an excel file. TJ Blasing

[from Tom Boden] Fredrik Try importing the file at http://cdiac.ornl.gov/ftp/ndp030/CSV-FILES/nation1751_2005.csv directly into a spreadsheet. Tom Boden

Q Re Falkland Islands Whose data are you using to establish our CO₂ footprint? Does the 14.8232 kilo tonnes per capita figure include the many foreign fishing vessels and ships that bunker here? Ref: <http://mdgs.un.org/unsd/mdg/Data.aspx> (10/20/08)

A We use energy data from the United Nations Statistics Office. Numbers do not include bunker loadings. But where did you get the 14.8232 number, I do not find it on our web site? Interestingly sometimes for smaller countries the population data can be as suspect as the energy data. Our population data are also from the UN. Gregg Marland

Q The recent Sunday New York Times (Week in Review, p.4) attributes a graph on Carbon Emissions to you. Can you give me a reference for this chart? Also, the chart stops at 2002. Is any data available since then? (10/19/08)

A Mark, Data from 1751-2005 can be found at <http://cdiac.ornl.gov/trends/emis/overview.html> and a proper citation is given at the bottom of the same page. Sincerely Robert Andres

Q Hi Guys, Can you confirm one of the basic assumptions that underlies the purpose of this new initiative.. The Hotter Earth Leadership Programme is designed to facilitate the evolution of consciousness- purposefully within the context of what we call the 'Big 3' challenges- peak oil, climate change and an unsustainable human population. Our website is at: <http://www.hotterearthleadership.org> It speaks for itself. Best wishes to you in these increasingly crazy, but predictable times. Sincerely, Dave Yaffey (10/17/08)

A Dear Dave, We appreciate your comment/feedback on the CDIAC Web site. Good luck with your new initiative. Obviously climate change is near and dear to our hearts. Peak oil and population are also important issues. Please look at our collection of climate data bases to ascertain "Hotter Earth"? by going to http://cdiac.ornl.gov/climate/temp/temp_table.html Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA (865) 241 4842 bodenta@ornl.gov

Q How are CO₂ emissions calculated? I have just read an article claiming that a motor car which travelled 400 miles on 5.6 gallons of diesel fuel produced 66.5 kilograms of CO₂. Given that 5.6 gallons is approx 25 litres and a litre of water weighs 1 kilogram (ergo 25 litres of diesel = less than 25 kilogram) how is it possible to convert 25 kilos of diesel into 66.5 kilos of CO₂. Has someone found a way to create matter from nothing? (10/16/08)

A During combustion carbon (atomic weight = 12) is oxidized to CO₂ (molecular weight = 44) so the mass increases by a factor of 44/12 when the oxygen is appropriated from the atmosphere. However, 66.5 still looks like a misprint; I calculated 56.5. TJ Blasing

[reply from Paul] Thanks for the explanation it helps me a lot. But I still have a major problem believing that a transatlantic jet that carries 30 or so tons of fuel somehow converts it into 260 tons of CO₂, or so we are told. It seems to fly in the face of everything I learned at school. Paul Stephenson

[reply from TJ] Paul: It's good to question what "they" tell you. Especially if "they" are strong advocates of a particular position. In this case, however, I think the 30 ton figure is off, not the 260. A 747 has a nominal range of 8430 miles and holds about 57,000 gallons of jet fuel; at 3 kilos/gallon this is about 171 Mg (171 metric tons). About 2.6 kg of carbon or around 9.5 kg of CO₂ enter the atmosphere for each gallon of jet fuel combusted. A transatlantic trip is usually less than 8460 miles; so discount accordingly. Cheers TJ

Q Hello, I was reading the UNDP HD report and there is a reference to CDIAC in relation to data on different country emissions. How are these emissions calculated? If you can answer, please bear in mind that I am a designer and not a scientist:) Thanks in advance! Simon (10/15/08)

A Dear Simon, Thank you for your question to the CDIAC Web site. Our fossil fuel emission calculations are relatively straightforward and are based primarily on energy production and trade data from the United Nations. We use these data to determine the amount of fossil fuels consumed by individual countries each year, broken down by major fuel type (e.g., liquid fuels -- crude oil, jet fuel, diesel). If you know how much fuel is consumed, the efficiency of combustion, and the amount of carbon contained in each fuel category one can estimate carbon released during the burning of the fuel. Greater details on our methodologies as well as the estimates themselves at different spatial scales, are available at <http://cdiac.ornl.gov/trends/emis/overview.html> Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA (865) 241 4842 bodenta@ornl.gov

Q Hi, I have some VERY interesting MSG weather images that I would like to submit to you for evaluation, where can I send them please? (10/14/08)

A Hi David, Thanks for your willingness to share the MSG weather images. Please use the file transfer system at the following URL to send us the images for review. <http://www.ornl.gov/~ncsgroup/fileupload.shtml> Sincerely, Tom Boden Carbon

Q We are working on a carbon cycle research report for DOE Office of Science. We would like to obtain permission to use an image of the "Mauna Loa" CO₂ curve in our report. However, the link to the Mauna Loa data site at CDIAC does not seem to be working <http://cdiac.ornl.gov/trends/CO2/sio-mlo.htm>. Do you know how we could get permission to use this figure, and how to obtain a print-quality version of the "Mauna Loa" CO₂ curve figure? Source information for the "Mauna Loa" figure (that we obtained from another site) is The Mauna Loa curve. (Source: Keeling C.D. and T.P. Whorf, 2005. Atmospheric CO₂ records from sites in the SIO air sampling network. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.) (10/14/08)

A Dear Jennifer, You have our permission to use the Mauna Loa data and graphic provided you acknowledge the original source. I suggest using the citation given at the bottom of the page at ... <http://cdiac.ornl.gov/trends/CO2/sio-mlo.html>. Please review the graphic at ... <http://cdiac.ornl.gov/trends/CO2/graphics/mlo144e.pdf>. If not adequate or deemed publication quality, the monthly and annual data are provided at <http://cdiac.ornl.gov/ftp/trends/CO2/maunaloaCO2> in a format suitable for use in the plotting software of your choice. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q Hi, I work for the emission team at Bloomberg and was interested in obtaining the data you provide regarding CO₂ emissions, especially your 2006 and 2007 extrapolated values. As a company we provide financial news and data globally, including statistical data on emissions. Can you please advise who would be the best person to contact to discuss the details. Many thanks Serhei (10/10/08)

A Serhei, I trust that you know that all of our emissions data through 2005 are on our web site. Let me know if you have trouble finding anything that you need. The preliminary values for 2006 and 2007 are currently only in a working spreadsheet and I attach a copy here. We do have the full 06-07 data by fuel and I can sort that out for you if you would like. Cheers, Gregg

Q I was trying to follow a link to get on your research data about the global, regional, and national CO₂ emissions of countries since 1751. If you could contact me as soon as possible, I would greatly appreciate it. (10/8/08)

A If this or any of its associated sub links don't work, call me at (865) 574-7368. <http://cdiac.ornl.gov/trends/emis/overview.html>
TJ Blasing

Q I'm not sure if this is the correct "area" please forward to the proper "area" if it is different, thanks. I'm trying to identify what software you suggest I look into that can assist me in creating my company's carbon footprint. Do you authorize or have such a software program certified for use which would allow me to use the "certified" output to create a plan to improve our carbon footprint which we can use to market our company and commitment to improve our planet? (10/7/08)

A Andrea Denny at EPA has a tool for state emissions, she might know who to ask about your particular interest. denny.andrea@epa.gov. TJ ++++++ (Terence J.) TJ Blasing Carbon Dioxide Information Analysis Center Building 1509 Oak Ridge National Laboratory Oak Ridge, TN 37831-6335 ----- Ph: (865) 574-7368 FAX: (865-574-2232) E-mail blasingtj@ornl.gov

Q Dear Gregg Marland, this is just to point at one value in your most recent update of the fossil fuel emissions, which I think is wrong. Please look at the South American emissions of the year 1949: http://cdiac.ornl.gov/ftp/trends/CO2_emis/amd.dat. They are negative (-13.987 MtC), but the sum of the national emissions is clearly positive (+25.406 MtC). May be, just the sign of the emissions from burning coal (-22.377 MtC) is switched. By this occasion I would like to thank you for providing this great data set to the community. We use it regularly. Thomas Raddatz (10/6/08)

A Dear Thomas, We appreciate your comment/feedback on the CDIAC Web site. We will check the 1949 fossil fuel emission estimate for South America relative to the sum of the countries. Be aware we have updated the global and national estimates through 2005, but not the regional estimates yet. The 1949 estimates should not change but I bring this to your attention nonetheless. Thanks again for alerting us to this possible error! Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am working on some energy issues and making sure that I have an accurate understanding of the CO₂ emissions data. My question is: why do your CO₂ emissions figures seem to differ from EIA's? For instance you show global CO₂ emissions for 2005 as 7.98 BMT of carbon, while they seem to say that it is 28.1 BMT (www.eia.doe.gov/oiaf/ieo/emissions.html - figure 78). Is there a difference in units here? I'm trying to put on a presentation this week, and need to know this answer, ASAP. Thank you for the explanation (10/6/08)

A Couple of things. Mainly, we track the carbon atom only, while DoE gives CO₂ which also includes the oxygen component. The conversion factor is $44/12 = 3.667$. Secondly, we include carbon emissions from cement manufacture = 0.315 BMT = about

0.32 BMT7.98 - 0.32 = 7.66; 7.66 X 3.667 = 28.1 Voila! TJ Blasing

[from Gregg Marland] John, The numbers are never going to match perfectly but they do pretty well when you get the units the same. Their numbers are tons of CO₂, ours are just the carbon in the CO₂. Multiply by 44/12 and you get pretty close. Gregg

Q I am interested in doing work in Alert, Canada and am aware that work by CDIAC has been conducted there in the past. Is it possible to list some other research groups that currently participate in environmental work up there with contact information as well as contact info of any current or near future CDIAC operations (10/6/08)

A Dear Greg We appreciate your question to the CDIAC Web site. I suggest you contact Doug Worthy. Doug works for Environment Canada in the Canadian Meteorological Service and operates the baseline monitoring station at Alert, NWT measuring CO₂ and a host of other greenhouse gases. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA bodenta@ornl.gov (865) 241 4842

Q I need to know the CO₂ emissions in Mexico and which are the principal sources. If you have some information about the renewable sources of energy and how it could help to reduce emissions. Thanks Nora Curiel (10/6/08)

A Nora, I think you will find some interesting material in the volume noted below - in particular there are some numbers on Mexico in the Introduction to section II. You will find the basic data on emissions on our web site <http://cdiac.ornl.gov> and click on fossil fuel emissions then national and follow the leads to Mexico. Preliminary values for 2006 and 2007 are in the attachment ----- Now available Final Report, Synthesis and Assessment Product 2.2 <http://www.climate-science.gov/Library/sap/sap2-2/final-report/default.htm> The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research

[King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.)]. National Oceanic and Atmospheric Administration National Climatic Data Center, Asheville, NC, USA, 242 pp. Printed copies will be available Winter 2008. Orders currently being accepted via GCRI Online Catalog at: http://www.gcrio.org/orders/product_info.php?products_id=186.

Q Scientists discover the REAL cause of Global Warming is the SUN-not CO₂ !!! Forward this email to the President of your Organization!!!! Two World Renown Scientists just have independently proven the REAL cause of Global Warming is the SUN-not CO₂ !!! I have two pieces of scientific evidence the Sun is the cause of the recent bout of Global Warming we have been experiencing-not CO₂ created by fossil burning fuels! The first piece of evidence you need to see is the British Documentary- featuring a noted M.I.T. Climatologist who was scientist who attended the U.N. Kyoto Protocols-, "The Great Global Warming Swindle," which proves scientifically that the current round of Global Warming we are experiencing is primarily due to increased Sun Spot Activity-and not an increase in CO₂ emissions caused by burning fossil fuels like oil, gasoline and natural gas!!! The documentary also shows scenes from Al Gore's, documentary "An Inconvenient Truth," and points out the flawed logic in his interpretation of the climate data. The web address to see the documentary keeps getting deleted, but do not panic. I think I have deduced why the web link to see the documentary keeps getting deleted. Soon, it will be available as a DVD, and you can buy a copy for a \$20.00. So, I think that's why the producers removed the web link. However, I found a French Web Link that still works!!! Fortunately the Audio is still in English-and it has French Subtitles!!! I will also provide the contact info web page of the producers of the documentary so you can contact them for how to get your own DVD. To see the video, click your mouse on the web link below. On my computer sometimes the video player pauses. Just be patient. It will start again shortly. Also, the title of the documentary is displayed 4 times before the end of the documentary its not over till you see the credits!!! ===== "The Great Global Warming Swindle," French Version <http://video.google.fr/videoplay?docid=-4123082535546754758> ===== "The Great Global Warming Swindle," producer's web page: <http://www.greatglobalwarmingswindleo.uk/> ===== "The Great Global Warming Swindle," Producer's Contact Web Page: <http://www.greatglobalwarmingswindleo.uk/contact.html> ===== Web Contact Tel: +44(0)20 7688 1711 Fax: +44(0)20 7680 1702 Email: info@wagtv.com Web: www.wagtv.com ===== The second piece of scientific evidence you need to read is a web newspaper article titled "Theory Says Climate Change Depends on Solar Wind/Comic Rays," by Alexandra Witze, the Science Writer for the Dallas Morning News, that discusses and includes an entire excerpt from a scientific article titled "Influence of Comic Rays on Earth's Climate", by Dr. Henrik Svensmark who works for the Solar-Terrestrial Physics Division Danish Meteorological Institute Lyngbyvej 30, DK-2100 Copenhagen, Denmark that discusses a new theory links climate change to cosmic rays, high-energy particles from space that wash over the planet. If the idea can be proved, it might imply that much of Earth's rising temperature could be caused by extraterrestrial factors, some physicists say. The web link to the newspaper article below ===== <http://www.tmgnow.com/repository/global/CREC.html> ===== I've also included a second web article about Dr. Henrik Svensmark's work a Discover Magazine (<http://discovermagazine.com/2007/jul/the-discover-interview-henrik-svensmark>) interview with Dr. Henrik Svensmark which asks two questions which I copied below. In 1996, when you reported that changes in the sun's activity could explain most or all of the recent rise in Earth's temperature the chairman of the United Nations Intergovernmental Panel called your announcement "extremely naive and irresponsible" How did you react? I was just stunned. I remember being shocked by how many thought what I was doing was terrible. I couldn't understand it because when you are a physicist, you are trained that when you find something that cannot be explained, something that doesn't fit, that is what you are excited about. If there is a possibility that you might have an explanation that is something that everybody thinks is what you should pursue. Here was exactly the opposite reaction. It was as though people were saying to me, "This is something that you

should not have done” That was very strange for me, and it has been more or less like that ever since. So it’s difficult to do climate research without being suspected of having a hidden agenda? Yes, it is frustrating. People can use this however they want, and I can’t stop them. Some are accusing me of doing it for political reasons, some are saying I’m doing it for the oil companies. This is just ridiculous. I think there’s a huge interest in discrediting what I’m doing, but I’ve sort of gotten used to this. I’ve convinced myself the only thing I can do is just to continue doing good science. And I think time will show that we are on the right track. As a final note, the scientist who did the “The Great Global Warming Swindle,” documentary was a had the same lie spread about his research—that it could not be trusted because he had financial ties to oil companies!! Please share this info with your readers A.S.A.P. and provide web links from your web site, so your readers can see the documentary and read the study themselves!!! Don Hagen dsthagen@verizon.net (10/4/08)

A Hi Don, Thanks I am familiar with both pieces of work. Certainly many of the factors (e.g., influences of water vapor, solar cycle, cosmic rays) described in these bodies of work are important and influencing climate change. I still subscribe to the greenhouse theory for two primary reasons. First, the reason for the recent rise in atmospheric CO₂ is clearly human, namely fossil fuel consumption. The jury is still out on whether this change in the atmosphere due to human and natural influences is causing the warming trend we have observed recently. The second determining factor, which sways me toward the CO₂ argument, is based on model results. Climate change models have come a long way and are quite sophisticated. BTW, they all include water vapor through transpiration, condensation, and evaporation— the Great Global Warming Swindle failed to mention details like this to the dismay of many quoted in the video production. Numerous scenarios have been run in the models (e.g., purely solar influences) and the ONLY scenario that comes close to representing the past 150 years is the CO₂ scenario. Regardless, I believe the problem is worth studying and theories like cosmic rays only lead to better understanding of this problem and the entire Earth system. Regards, Tom

Q I would like to know the latest figure for GHG concentrations. All I find is CO₂ concentration (383 ppm), but I would need a figure for all six GHGs expressed in CO₂ equivalent (10/2/08)

A Dear Marton Kruppa, Go to: http://cdiac.ornl.gov/pns/current_ghg.html for recent concentrations and see if you can find the 6 you like. For now, I will assume you are referring to the Kyoto Protocol. Because we identify specific gases, information for the groupings in the Kyoto Protocol may have to be cobbled together. Then go to: <http://www3.interscience.wiley.com/cgi-bin/fulltext/116836623/PDFSTART> For information on calculating equivalent CO₂. We appreciate your question to the CDIA Web site. Sincerely, TJ Blasing

Q I am looking for the 1990 and 2005 stats on CO₂ levels in the world countries and I am unable to find it on your website. If you could get back to me with where I can find this it would be greatly appreciated. Jonathan (10/2/08)

A Jonathan, Start at <http://cdiac.ornl.gov>. At the bottom right corner of the page click on "fossil fuel CO₂ emissions". Click on "global, regional and national annual time series". Click on "national". From here you can go directly to the country of choice. These files are being updated as we speak. At this minute all countries have been updated to 2005 except those that begin with the letters R, S, and T. If you want one of these countries you can still find the updated file by going to "All countries, one file - comma delimited". Let me know if you encounter any problems. Cheers, Gregg

Q My carbon dioxide detector went off and said a number, then GAS. What is an indication of? (9/28/08)

A Dear Gwen, Carbon monoxide (CO) or carbon dioxide (CO₂) detector? Many people have carbon monoxide detectors in their home, including myself, while few people to my knowledge have CO₂ detectors. Do you remember the value displayed on the panel? Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q I am currently a post graduate environmental science and management student at the University of Trinidad and Tobago and I am currently doing a project based on the relationship between carbon dioxide emissions and per capita income. I would like to know if the CDIA would have the carbon dioxide emissions statistics for Trinidad and Tobago for the period 1990-2008. This information would be used to formulate an EKC analysis for Carbon dioxide emissions. Any information or assistance provided would be greatly appreciated. Yours respectfully, Sean Banfield (9/26/08)

A I just checked our site http://cdiac.ornl.gov/trends/emis/t_t.html and we have annual fossil carbon (as CO₂) emissions through 2004. However, I think more recent data may be available from Gregg Marland, and he isn't in his office yet. He will probably be in later today and I have forwarded this to him. He might also be able to provide perspectives as to error terms and any problems that might have occurred with these data. TJ Blasing

[from Gregg Marland] Sean, if you go to our web site and look at the list of emissions from "all countries in one file", you will find the T&T data updated to 2005. If you have trouble finding this, let me know. We are gradually getting the individual files updated, but it takes time and you are near the end of the alphabet. We have preliminary estimates for 2006 and 2007 for many of the larger countries, but the data we need to do this are not available for Trinidad and Tobago. Cheers, Gregg

Q Are the concentrations of carbon dioxide reported in the Mauna Loa data for a specific altitude or do they relate to the total atmosphere? I am thinking, of course, about the segregation of carbon dioxide according to the barometric formula (9/26/08)

A Dear Hugo F. Franzen, We appreciate your question to the CDIAC Web site. The Mauna Loa data are for the position/elevation of the instruments which are likely available via the SIO website <http://scrippsCC2.ucsd.edu/home/index.php>. But, CO₂ is so well mixed throughout the troposphere that researchers commonly don't worry about the elevation of the various long-term sites. Perhaps in certain dynamical models of high spatial and temporal resolution, but not otherwise. Dale Kaiser, CDIAC
----- Are the concentrations of carbon dioxide reported in the Mauna Loa data for a specific altitude or do they relate to the total atmosphere? I am thinking, of course, about the segregation of carbon dioxide according to the barometric formula

Q I am preparing a survey report on the various protocols for inventorying/estimating carbon generation associated with human activities. We're interested in questions of scope, analytical techniques, assumptions, and data sources. Is there someone with your organization who can speak with me on these subjects? Thanks (9/26/08)

A Dear Brent Eubanks, We appreciate your question to the CDIAC Web site. Sorry this took so long; I haven't checked the inbox lately and I never got a copy of this question sent to me. We use a "top down" approach, obtaining total energy consumption for each fuel type (coal, oil, gas) one way or another from a large political entity such as a state or a nation. Knowing the amount of fuel used to obtain a given amount of energy, we then obtain the carbon released from each type of fuel to produce the given quantity of energy. This can be a bit tricky because, for example, the heat that goes out the stack at an electrical generating plant is part of the energy realized from combustion of the fossil fuel. This works well at the national scale, for state-level data in the U.S., we use pretty much the same methodology as EPA http://www.epa.gov/climatechange/emissions/state_energyCC2inv.html. Bottom-up approaches are used by several investigators; Kevin Gurney at Purdue University has produced a set of data for 2002 from a project he calls "Vulcan." It is on the web; if you have trouble finding it, let me know. Here are a couple of references to other work: o Frank Southworth, Anthon Sonnenberg and Marilyn A. Brown. 2008. "The Transportation Energy and Carbon Footprints of the 100 Largest Metropolitan Areas," Georgia Institute of Technology School of Public Policy Working Paper, May (<http://www.spp.gatech.edu/faculty/workingpapers.php>). o Marilyn A. Brown and Cecelia (Elise) Logan. 2008. "The Residential Energy and Carbon Footprints of the 100 Largest Metropolitan Areas", Georgia Institute of Technology School of Public Policy Working Paper, May (<http://www.spp.gatech.edu/faculty/workingpapers.php>). Tellus 60B pp 1-10 (authors are Gregg and Andres). That would be a good paper to read before starting your research. A paper by Gregg and Andres, Tellus 60B pp 1-10 would be a good paper to read before starting your research. Finally, sometimes we have to use "proxy data" such as using steel outputs as an indicator of carbon from coking coal. Sincerely, TJ Blasing

Q There are several countries with negative emissions in the data sheet from http://cdiac.ornl.gov/trends/emis/tre_coun.html. How can these negatives be explained? Thank you. (9/22/08)

A There are a couple of ways to end up with negative numbers. The most common: Domestic consumption is calculated as production minus exports plus imports. If production is large and exports are large, the difference between large numbers can be negative with small errors in either or both of the two large numbers. Second, since we treat emissions for the different fuel forms, envision a country that produces coal, converts it to a liquid (or gas) and exports the gas. The number for emissions from gas would be negative (0 production minus exports), but the actual emissions would end up being counted in the solid fuel accounts. There are probably other possibilities once you get your imagination going. The second explanation is easy to deal with once you realize that the total emissions are accurately captured, even if in the wrong column. The second may be harder to deal with because it is simply an artifact of statistical uncertainty. Let me know if questions remain. Gregg

Q When I see numbers for CO₂ concentrations in the atmosphere given to 4 significant figures, like 377.3 ppm, I'm very suspicious that a scientist is not involved in writing them down. I have a question: What about the geographical distribution of atmospheric CO₂? That is, what is the average concentration over the various oceans, over the various continents, etc? I'm a retired physics professor, so I have no difficulty with technical, quantitative things. Thanks a lot, Sam Werner.

----- Sam and Laura Werner 7620 Augustine Way Gaithersburg MD 20879 sam.werner@verizon.net Tel (301)208-2549 (9/22/08)

A Dear Sam: The links below (the first two are direct to the 2 most authoritative networks) likely have background information on the individual measurements (daily or sub-daily time scale) so you can read about how they do their averaging and choose the subsequent level of reporting precision. With regard to spatial distribution, you are likely to also find this discussed. As you are aware, CO₂ is a very well-mixed trace gas, but there are interesting geographical differences. For example, NH stations may have a more dramatic seasonal cycle due to most of the biosphere being in the NH. Even South Pole measurements will show a seasonal cycle though, driven by the biosphere. <http://scrippsCC2.ucsd.edu/home/index.php> <http://www.esrl.noaa.gov/gmd/dv/ccg/> <http://cdiac.ornl.gov/trends/CO2/sio-keel.html> Dale Kaiser, CDIAC

Q Is there some knowledge about the CO₂ absorption by different kinds of trees in relation with their alter, light conditions, ground conditions, weight, volume, leave surface, temperature, geographic position, etc.? Do you know where I can find detailed information about this subject? (9/17/08)

A Hi, there are several different places I can point you. It's a complex, fast-changing research subject and there is no one-stop shopping place. Try these to get started: <http://cdiac.ornl.gov/program/CSEQ/cseqprojectdata.html> <http://>

Q Dear madam or sir, I am trying to learn more about the lifecycle carbon emissions of the production herbicides and fungicides. I have a number of rough calculations in order to do this, but have no way of double check them and have had very little luck in finding already existing information about the life cycle emissions calculations for herbicides and fungicides. I was wondering if 1. you already had this information that I could look at or 2. you could point me in the correct direction as far as finding this information. Thank you so much for your time and help. Cheers, Sieren (9/17/08)

A Sieren, have you seen our paper? West, T.O., and G. Marland, 2002. A synthesis of carbon sequestration, carbon emissions, and net carbon flux in agriculture comparing tillage practices in the United States. *Agriculture, Ecosystems, and Environment* 91: 217-232. This is probably a good start. I am copying Tris West on this reply with the possibility that he knows of something more recent. Gregg

[from Tris West] Dear Sieren, The paper is attached. Spatial (county level) distribution of data in the attached paper is also provided here <http://cdiac.ornl.gov/carbonmanagement/cropfossilemissions>. Cheers, Tris West

Q Hi, I am working with the pCO₂ Takahashi data that is available on your site. First of all, thank you for putting such a great resource together. I had a few questions regarding this particular set of data. I have read through the Takahashi literature included on the site, concerning how the data was collected, etc, but I still have a question as to why there are 2 temperature measurements (Temp_pCO₂ and SST). What is the difference between the two (obviously there is some difference as the two values are never exactly the same at any data point). Why are both of these, and two pCO₂ values recorded and included. It seems that the pCO₂_TEQ is the in situ data which is what I hope to be working with, but I was hoping to understand the other values a little bit better in case they may become useful further into my research. Any help understanding these values would be greatly appreciated. Thanks (9/17/08)

A Dear Amanda Fay, We appreciate your question to the CDIA Web site. We use two temperatures as SST is in situ temperature of the sea surface at the time of sampling and Temp_pCO₂ is a sample temperature at the time of measurement process. In this matter, we can calculate pCO₂ at sea surface temperature and have a measurement at the temperature during the equilibration. So, some scientists use pCO₂@SST and some pCO₂@TEQ for their research. Please let me know if you have any more questions. Sincerely, Alex Kozyr, The Oceanographic Data Analyst

Q Do you all have charts that track Carbon Dioxide levels and temperatures (history and pre-history)? Thanks, Anne Paine (9/17/08)

A Dear Anne, Yes, we do have records tracking atmospheric CO₂ and air temperature. One good example, the Vostok ice core record, spans a very long period of time. Please see ... <http://cdiac.ornl.gov/ftp/trends/temp/vostok/vostok1999.temp.dat> <http://cdiac.ornl.gov/trends/CO2/vostok.html>. Thanks and we appreciate your question to the CDIA Web site. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6335 (865) 241 4842 bodenta@ornl.gov

Q Ranking of the world's countries by 2005 per capita fossil fuel CO₂ emission rates. National per capita estimates (CO₂_CAP) are expressed in metric tons of carbon. Why the data concerning Guam, Mariana, Porto Rico, American Virgins and Samoas does not appear any more? (9/16/08)

A Jean, we always start with energy data from the United Nations. Data for Guam, Samoa, Puerto Rico, US Virgin Islands are all included with the US and in the last couple of years the UN has stopped giving their data separately. Gregg

Q I was impressed by the amount of manipulation of pCO₂ data I could do simply with the WAVES database through your website. However, every time I try to get a netcdf file as my output I get an error message saying that there was an AJAX error. Is this a common problem? How can I get around this and end up with some netcdf files. I am looking to customize the lap and lon to focus in on the north atlantic pCO₂ data. Please let me know if you can assist my efforts or let me know if this is a common error. (9/15/08)

A Dear Amanda, We appreciate your comment/feedback to the CDIA web site regarding our WAVES data interface. I trust Misha Krassovski and Alex Kozyr have been in touch. I know they have made modifications to the WAVES system, in part, due to helpful comments like yours. Thanks again for taking the time to provide feedback on our products and services. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q The data for 2005 fossilfuel CO₂ emissionsper nation are expressedas metric tons of carbon, and not CO₂. Why is that the case, and what difference does that make if one is trying to find the latest data on total CO₂ levels per country? Further, does the CDIAC have data available on fossilfuel CO₂ emissionsfor years more recent than 2005? Thank! (9/15/08)

A Josiah, If one is interested in the global cycling of carbon through the ocean, biosphere, atmosphere, etc. it is easiest to work in units of carbon rather than CO₂. If one is interested in only the atmosphere it really makes little difference whether CO₂ emissions are expressed in terms of CO₂ or of the carbon in the CO₂ - one can get easily from one to the other by multiplying by the ratio of the molecular masses (mass of C times 44/12 gives mass of CO₂). Preliminary estimates for emissions in 2006 and 2007 (most countries and the global total) will be released on 26 September. It may take the numbers a little longer to find their way onto the web site. If you would like these numbers, you might send me an e-mail reminder on or after the 26th and I will pass along the spreadsheet. And don't hesitate to ask if my quick answer above does not take care of your query. Gregg

Q Your publication of current concentrations of greenhouse gases (2006) does not recognize or provide data for water vapor. Since H₂O is the dominant greenhouse gas, this seems peculiar. Is there a reason for this omission? (9/15/08)

A Dear Rick Fischer, We appreciate your question to the CDIAC Web site. Please see the following FAQ on our site <http://cdiacornl.gov/faq.html#Q23>. Sincerely, Dale Kaiser CDIAC

Q Hi, What percentage of the the CO₂ generated on earth is generated by man vs. nature? Thank you, Lee (9/14/08)

A Dear Lee Nicholson, We appreciate your question to the CDIAC Web site. Please see this FAQ on our site <http://cdiacornl.gov/faq.html#Q4>. Man-made emissions show up as the 6.2 Gt in the associated/linked diagram of carbon fluxes. This amount is now over 7 Gt per year. Notice that this amount is quite small compared to the natural sources of carbon. However, the reason there is concern over CO₂ emissions is that our man-made component upsets the normal carbon balance and is causing the concentration of CO₂ in the atmosphere to grow significantly over time. (http://scrippsCC2.ucsd.edu/graphics_gallery/mauna_loa_record/mauna_loa_record.html) Sincerely, Dale Kaiser CDIAC

Q Hello, As I preside as chair of the Data Acquisition and Reporting task force for sustainability we are looking for regional data for the amount of CO₂ generated per Kwh in the United States. Do you have, or know where, I might find the emission data by state or region? Thank you, Carl Davis (9/10/08)

A Dear Carl Davis, I've usually heard the numbers given in terms of energy delivered, even though that would be less precise due to errors in estimating transmission loss. Last time I checked, TVA was about the national average of 163 g-C/kWh generated (598 g-CO₂/kWh generated). The western U.S. is lower due to hydropower availability but that's all I know off the top of my head. Andrea Denny at EPA: denny.andrea@epa.gov Might be able to give you some leads. I'm sending a paper by separate e-mail; it may help. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

[from Gregg Marland] Carl, It sounds to me like you are looking at CO₂ emissions from electric power generation. I think you are going to have to do some arithmetic to get what you want. The US Department of Energy has data on the mix of electricity generation by state and it would not be very difficult to estimate CO₂/kwh for each of the major power sources and then to calculate the average for each state based on the mix of sources. Gregg Marland

Q Where can I access CDIAC data post-2004 for CO₂ emissions from fossil fuel use and land clearing? (9/9/08)

A Tim, We have added numbers for 2005 and revised earlier values in our annual update. The update was completed 10 days ago. Part of it is now posted on our web site and the rest is going up as time permits. Any time series on the web site that goes through 2005 has been fully updated. I will send the full file of all countries to you as a separate e-mail. Preliminary estimates for 2006 and 2007 have been completed and we are in the process of bringing the data together and preparing appropriate documentation. The data set should be available within 2 weeks. Gregg

Q Is there any historical/timeline data that measures the level of water vapor in the atmosphere? Such data seems abundant for CO₂, but if I am correct, water vapor is the most plentiful greenhouse gas, correct, so I hope such data for it is available as well. (9/8/08)

A Dear Jeff Turner, We appreciate your question to the CDIAC Web site. Indeed, the amount of water vapor in the atmosphere has been measured directly (from radiosondes since roughly mid-20th century) and indirectly through surface measurements of temperature and dew point temperature (which let one derive absolute and relative humidity, long records available from many global and regional databases). Please see the expert sources I give links to below. The IPCC link will actually discuss time series of water "vapour", and the Yale link gives a nice explanation of why one cannot simply equate the physics of the greenhouse effects associated with water vapor and CO₂ (the latter really being the "driver" of current and future atmospheric temperature trends). <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> http://www.yaleclimatemediaforum.org/ccm/0108_watervapor.htm Sincerely,

Q | The numbers you come up with for Norway do not correspond with the number presented by the country's Bureau of census (<http://www.ssb.no/vis/emner/01/04/10/klimagassr/main.html>) Can you explain? regards Sigmund Hov Moen (9/2/08)

A | Dear Sigmund, Thank you for your comment on the Norwegian fossil fuel CO₂ emission estimates. Our estimates are derived from energy statistics published by the United Nations. The UN receives energy data for Norway from the International Energy Agency (IEA) in Paris. Norway reports directly to IEA. Statistics Norway, the Norwegian Petroleum Directorate, IEA, and the UN are all aware of the discrepancies in the Norwegian data. Part of the problem lies within Statistics Norway and the Norwegian Petroleum Directorate, but much of the problem lies with the UN and their handling of natural gas liquids data. The IEA and UN energy accounting systems differ and this introduces problems. We have been working on this problem for almost a decade. We realize there are problems in our Norwegian fossil fuel CO₂ emission time series but our estimates are reproducible back to the published UN energy statistics. I am very hopeful, and actually quite optimistic, these problems are on the verge of being resolved thanks to review efforts by all parties (e.g., Statistics Norway has recently submitted revised data to IEA). Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA bodenta@ornl.gov

Q | > Dear Sir or Madam >> Is it possible to get a list of addresses for all weather stations located > in Alabama? >> Thank you, >> Jennings Byrd (8/28/08)

A | In the broadest sense there would be 100s of "weather" stations in AL. Most are so-called "COOP" (cooperative observer) stations, which could range from a dedicated private individual certified by NOAA to staff at a dam or agricultural research station. Best place to go to collect info. on any and all stations would be the National Climatic Data Center website <http://www.ncdc.noaa.gov>. You might try the powerful tool you get to from the "Search by Map" link, and also the "Find a Station" link. Regards Dale Kaiser CDIAC

Q | A friend of mine believes in the answers provided at <http://www.geocraft.com/WVFossil/GlobWarmTest/start.html>. Please explain why those answers are not complete. Thanks a lot. (8/28/08)

A | Dear Tien Nguyen, We appreciate your question to the CDIAC Web site. I'm afraid the cute little global warming quiz, while containing some factual information, is largely someone's attempt to cherry pick "fuzzy" answers and concepts espoused by global warming skeptics. There is nothing wrong per se with being a skeptic, it's just that many, many of these skeptics are not scientists, and even those that are are often not CLIMATE scientists. There are so many broad statements and characterizations on this site - lacking proper context and full explanations - that it can only act as a disservice to the public. My statement in itself probably sounds vague, but that's out of necessity because we don't have the resources (time!) to carefully clarify every point of confusion/disinformation on the site. The very best place to point you for objective and detailed information about the "science of climate change" is the latest IPCC report found here: <http://ipcc.wg1.ucar.edu/wg1/wg1-report.html>. While largely technical, the front matter (e.g., the FAQs section) is quite accessible, certainly no less so than some of the stuff on the global warming test, it's just that this work represents years of work by objective climate experts and therefore is infinitely more trustworthy. Sincerely, Dale Kaiser CDIAC

Q | > From: mercury survey@daac.ornl.gov [mailto:mercury survey@daac.ornl.gov] >> Sent: Sunday, August 24, 2008 10:06 PM >> To: ORNL DAAC User Services > Subject: Mercury Survey 1 >> Sun Aug 24 22:05:57 2008 > Instance > cdiac(NEW) > Clicked > Mercury Exit Survey > Workstation > 196.205.199.22 (196.205.199.22) > Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1) > Respondent > hossam > helwan university > egypt > hossam_geography@yahoo.com > Search satisfaction > yes >> Results satisfaction > yes >> Suggested Datasets > climate data about egypt stations >> NOTE: Participant has requested a response to comments (8/24/08)

A | Dear Hossam, Thank you for your feedback through the user survey feature of CDIAC's Mercury search tool. You had suggested we make available climate data from Egyptian stations. I'm not sure what data you were able to locate on our site, but we do in fact have some Egyptian climate data as part of the Global Historical Climatology Network (GHCN). The CDIAC site only has vs. 1 of GHCN, which extends throughout about 1990: <http://cdiac.ornl.gov/epubs/ndp/ndp041/ndp041.html>. However, the continually updated version of GHCN is distributed by the National Climatic Data Center (NCDC) in Asheville, North Carolina, USA. The monthly data can be found here: <http://www.ncdc.noaa.gov/oa/climate/ghcn-monthly/index.php> and the daily data can be found here: <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/>. These sites are likely to have the most Egyptian climate data that is readily available to those outside of Egypt. I hope this information is helpful. Please don't hesitate to contact me with any further questions. Regards Dale Kaiser CDIAC

Q | > Is there any place to find maps that show average historical high and > (separately) average historical low temperature bands (5 or 10 > degrees) for the USA by month? >> Thank you very much - Robert Moon (8/24/08)

A | Not sure about that exact type of map. You could do an all out search at: <http://www.ncdc.noaa.gov>. Come to think of it you may want to play around with: <http://www.ncdc.noaa.gov/oa/land.html> clicking on the "Search by Map" link. Also, you can

plot global monthly anomalies at: <http://www.ncdc.noaa.gov/gcag/index.jsp> And finally, here is a neat link to a lot of data having to do with climate <http://cdp.ucar.edu/home/home.htm> If you hit upon the exact type of map that you want, pls. let me know.
Dale Kaiser CDIAC

Q I have seen in presentation a graph of GHG Emissions Worldwide that shows the GHG emissions in Gt CO₂ eg for the 5 year periods of 1990 to 2030. I would like to get a copy of the graph that I could load into my Powerpoint presentation for use at an AIST conference in Baltimore in Nov 2008. Also, are there other graphs that would be useful to discuss for reduction of CO₂ emission in steelmaking? Thanks Roy Whipp (8/22/08)

A Roy, All of our CO₂ emission estimates are for historic emissions. We have data up through 2005. The International Energy Agency (IEA) has an annual report called World Energy Outlook that projects emissions to 2030. I am going to guess that this is where the figure comes from. You can get there through the IES.org web site, let me know if you run into problems. I personally do not know the literature on steelmaking but my inclination would be to Google Ernst Worrell and see if that turns up something useful. Ernst has done a number of studies related to CO₂ emissions from industry and materials substitution. Given your interests you may even know Ernst. Good guy! If we can help you with international or historic emissions, let us know. Gregg

Q hi there I'm looking for someone in the world who measures PPM of carbon in the atmosphere on an ongoing basis. Do you know of anyone who does this and who would be prepared to share their data? Best mark (8/21/08)

A Dear mark bjornsgaard <http://www.esrl.noaa.gov/gmd/ccgg/trends/> is about as close as you can get. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q Hi, I'm trying to determine if there have been any gas studies of the Chaiten Volcano in Chile, specifically to determine the volume of CO₂ that the 2008 eruption has released into the atmosphere. Do you know where I might go to find this information? Many thanks, Owen (8/18/08)

A Owen, this is out of our normal realm, but our colleague Bob Andres is into gas emissions from volcanoes and may be able to help. His address is on the cc line above. Gregg Marland

[from Bob Andres] Owen, I do not know anyone who has studied CO₂ release from Chaiten. It is not a measurement typically done at volcanoes. SO₂ measurements at Chaiten have been done. A contact for those measurements is Simon Carn, scarn@umbc.edu. I hope this helps.

Q Hi, Can you tell me how much carbon dioxide is currently in the atmosphere (by mass) and how much carbon dioxide (by mass) is released into the atmosphere each year by man? Thanks (8/17/08)

A Mac I don't know how precisely you need this to be, but the mass amount of CO₂ in the atmosphere can be calculated as the amount in parts per million times 2.13 X 3.667 and the result is in petagrams (Pg). A petagram is 10 to the 15th power of grams, or a billion metric tons. 385 ppmv X 2.13 X 3.667 = 3007 Pg-CO₂. Over the last 5 years, human activities including land-use change have added 32 Pg-CO₂ per year, about half of that 32 remains in the atmosphere so the total amount has been increasing by about 16 Pg per year, on average. Preindustrial CO₂ concentrations have increased from around 280 parts per million by volume (ppmv) to 385 ppmv, for an increase of about 37% of the original amount. In Pg this would be an increase from 2187 Pg to 3006 Pg, or about 819 Pg. Because 819/16 is about 51, and we know that industrial activity was going strong by 1957, and that the amounts of CO₂ in the atmosphere then were already around 315 ppmv, the annual increases must themselves have increased. This is consistent with the fact that the annual amounts of anthropogenic CO₂ have increased with time. TJ Blasing

Q I would like to collect hourly or daily rainfall data from the NOAA Milan TN Experimental Station for 2008 and continually monitor through 2009. Is there a website that I could find this data? (8/15/08)

A Hi Melanie, Tom Boden has asked me to help you out with your question about precip. data for Milan, and I'm glad to do so. You had said: "I would like to collect hourly or daily rainfall data from the NOAA Milan TN Experimental Station for 2008 and continually monitor through 2009. Is there a website that I could find this data?" The National Climatic Data Center (NCDC) in Asheville, NC has these DAILY data (as well as data from about every "weather" station in the world). My search has not shown me anything about hourly observations. Milan ("Milan Exp Station") is designated as a Cooperative Observing Station and apparently does not have an ASOS (Automated Surface Observation System). Therefore, they would have typical daily data like max/min temp, 24-h precip, and so on. You can get the data by going here: <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwDI-StnSrch-StnID-20018263> and this was found by using "Find a Station" on the NCDC homepage (www.ncdc.noaa.gov) and keeping the Station Name button activated and typing "Milan, TN" in the search box. It looks like the data for this type of CO-OP station is available 1-2 months after the end of a given month. Right now, data are available through June. From the Milan page, here's a few clicks you'd do to get started on ordering (free to our .gov domain) the data: "DATA" "Digital ASCII Files" "SOD - Daily Surface Data (TD3200/3210 combined)". At that point you are presented with a few basic choices and then your order is staged to an FTP area, and after they are there, are also available by a link on the webpage. If you have any questions as you go through this procedure, just give me a call and I can talk you through things or try to answer additional questions. Regards, Dale Kaiser

Q Dear T.J. I wonder if I could pick your brains? We are looking to put together data on global/US/EU emissions- we have used data provided by yourself to show global emission, could you provide data showing the above breakdown? This is a long shot too...but we are looking to get emission on a state level. We have some data from 2002 (unknown source as yet) - just wondered if you knew of anything more recent. Any help is much appreciated. Regards Andrew (8/15/08)

A Andrew, Slim pickins! I would say. Try: http://cdiac.ornl.gov/trends/emis_mon/stateemis/emis_state.htm which will give annual total fossil fuel carbon emissions for each state for 1960-2001, plus some other stuff. http://www.epa.gov/climatechange/emissions/state_energyCC2inv.html will give annual carbon emissions by state for 1990-2005 plus some different other stuff. The 2 time series are surprisingly compatible where they overlap. TJ

Q Are the statements contained in the Trends section under CLIMATE reflective of current data? I have read that a recent correction to the dataset resulted in the revelation that the warmest years were in the 1930s. (8/15/08)

A Dear Michael Martin, We appreciate your question to the CDIAC Web site. Without knowing specifically which Trend step data you're referring to, I'm going to take a guess that you were referring to (and reading about) the time series of Hansen et al. If this is the case, yes, there are some changes that have taken place in their analysis but the effects were minor and don't change the overall character of the time series. You can read about these changes on the Hansen/NASA site <http://data.giss.nasa.gov/gistemp/> specifically the link "Update to Analysis". Feel free to contact me directly if this does not answer your question, and please give me as much specific information as you can. Sincerely, Dale Kaiser CDIAC kaiserdp@ornl.gov

Q Some time ago I talked with you about getting NOAA data, which is why I am now bothering you. If you (or anyone you direct me to) could be of any assistance I would appreciate it. I would like to collect hourly or daily rainfall data from the NOAA Milan TN Experimental Station for 2008 and continually monitor through 2009. Is there a website that I could find this data? Thank you for your time. Melanie A. Mayes Environmental Sciences Division Oak Ridge National Laboratory P.O. Box 2008, MS-6038 [Bethel Valley Road for package delivery] Oak Ridge, TN 37831 (8/15/08)

A Hi Melanie, Tom Boden has asked me to help you out with your question about precip. data for Milan, and I'm glad to do so. You had said: "I would like to collect hourly or daily rainfall data from the NOAA Milan TN Experimental Station for 2008 and continually monitor through 2009. Is there a website that I could find this data?" The National Climatic Data Center (NCDC) in Asheville, NC has these DAILY data (as well as data from about every "weather" station in the world). My search has not shown me anything about hourly observations. Milan ("Milan Exp Station") is designated as a Cooperative Observing Station and apparently does not have an ASOS (Automated Surface Observation System). Therefore, they would have typical daily data like max/min temp, 24-h precip, and so on. You can get the data by going here: <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwDI-StnSrch-StnID-20018263> and this was found by using "Find a Station" on the NCDC homepage (www.ncdc.noaa.gov) and keeping the Station Name button activated and typing "Milan, TN" in the search box. It looks like the data for this type of CO-OP station is available 1-2 months after the end of a given month. Right now, data are available through June. From the Milan page, here's a few clicks you'd do to get started on ordering (free to our .gov domain) the data. "DATA" "Digital ASCII Files" "SOD - Daily Surface Data (TD3200/3210 combined)". At that point you are presented with a few basic choices and then your order is staged to an FTP area, and after they are there, are also available by a link on the webpage. If you have any questions as you go through this procedure, just give me a call and I can talk you through things or try to answer additional questions. Regards, Dale Kaiser

Q Dear Sir/ Madam, My name is Raymond Mugandani. I am a lecturer at the Midlands State University in Zimbabwe. I am interested in carrying out research that would come up with models to estimate future fluxes of greenhouse gases with the view to come up with scenarios for future estimates. My problem is lack of funding to do such research projects. I am therefore trying to find out if I can get data for carbon fluxes for certain regions in Africa or beyond which I can combine with meteorological data for modelling. (I had developed a research proposal for carbon dynamics fluxes in different land use systems but could not get funding to go ahead with it and hence my proposal to use data already collected and slightly change my research focus). Please advise me in this regard. Thank you, Raymond (8/14/08)

A See if this helps: http://cdiac.esd.ornl.gov/trends/emis/tre_afr.htm TJ Blasing

Q I am trying to compare Greenhouse Gas Emissions from several countries from 1990 vs recent years and I have found a number of sites that provide conflicting data even when I account for CO₂ conversion of other Greenhouse Gases. Would you be able to recommend a site where I might obtain this information? I am not looking for the data as percentages, rather I am looking for actual values. Thank you in advance (8/13/08)

A Dear Tony, We appreciate your question to the CDIAC Web site. Our fossil fuel carbon emission estimates may be found at <http://cdiac.ornl.gov/trends/emis/overview.html>. I can also appreciate your difficulties teasing out the reporting differences between greenhouse gas emission estimates. It almost takes an expert to filter out unit differences and to properly ascertain what the estimate actually includes (e.g., bunker fuels, cement production, fuels used for non-energy purposes, etc) in order to be able to compare apples to apples. Good luck and please let me know if we may be of further assistance. Sincerely, Tom Boden Carbon

Q Dear Sir or Madam, Is it possible to get a list of addresses for all weather stations located in Alabama? Thank you, Jennings Byrd (8/8/08)

A In the broadest sense there would be 100s of "weather" stations in AL. Most are so-called "COOP" (cooperative observer) stations which could range from a dedicated private individual certified by NOAA to staff at a dam or agricultural research station. Best place to go to collect info. on any and all stations would be the National Climatic Data Center website <http://www.ncdc.noaa.gov>. You might try the powerful tool you get to from the "Search by Map" link, and also the "Find a Station" link. Regards Dale Kaiser CDIAC

Q Are there available statistics regarding global CO₂ emissions that are more recent than 2004? If so, where might I find them? (8/6/08)

A Russell, we have preliminary data for 2005 and 2006 (attached). But we are currently working on an update that will provide revised numbers for the most recent years, a complete accounting for 2005, and preliminary values for 2006 and 2007. This should be available in, guessing 3 weeks

Q I am a graduate student who is currently working on a research that requires the monthly temperature of United States data from 1970 to 2007. Can you please kindly show me where I can obtain (8/6/08)

A These pages should be useful: http://cdo.ncdc.noaa.gov/cgi-bin/climate_normals/climate_normals.pl <http://www.ncdc.noaa.gov/oa/climate/research/trends.html>. As far as a monthly mean for every month since 1970, I don't know if such a summary exists anywhere. There are reports since about 2000 via graphs: <http://www.ncdc.noaa.gov/oa/climate/research/2007/cmb-prod-us-2007.html>. This graph can actually show you the long-term mean temp of the US: http://www.ncdc.noaa.gov/img/climate/research/2007/us-final/Reg110Dv00Elem02_01122007_pg.gif. Hope this is of some help. The NCDC website is where you would find further useful things. Dale Kaiser CDIAC

Q My name is Barry Bhola and I am doing a research case study on CO₂ emissions produced in Trinidad and Tobago. I came across your data on the aggregate volumes by country, through 2004-5. I would like to know if you can assist me in finding out who are the 20 largest emitters in Trinidad and Tobago each by annual volume. I know the category they will fall into - refinery, oil & gas drilling, production of ammonia, methanol, LPG, LNG, cement and steel, and electricity generation. If you are unable to provide this data, can you explain to me how you arrive at your aggregate volume? Kind regards, Barry Bhola (8/4/08)

A Barry, Our estimates are what one might call "top down". They are based on total energy consumption for the country as reported in the energy statistics of the United Nations. We have data on total consumption of coal and oil, for example. We do not look at individual energy consumers and are not able to help you with the 20 largest producers. I can say that I suspect you are correct in identifying the classes of facilities that are likely to include the largest emitters. Have you looked to see if the country has filed an emissions estimate with the United Nations Framework Convention on Climate Change? This report should give a sectoral breakdown of emissions. You can find if there is a Trinidad and Tobago report by going to the web site of the UNFCCC at www.unfccc.de. Gregg Marland

Q do you or don't you believe that carbon dioxide is a bad gas because in my opinion I don't think it is but you're the expert so please email me (8/2/08)

A Carbon dioxide is a gas that is part of human respiration, is an essential nutrient for plants, has many important industrial applications, and plays a key role in the energy balance of the Earth's atmosphere. Many people are concerned that the concentration in the atmosphere is increasing and that this will have undesirable consequences for the Earth's climate system. Cheers, Gregg Marland

[from TJ] Elizabeth Another perspective on CO₂. I agree completely with Gregg Marland. What follows is just another perspective from a climatologist. Of course gases are not inherently good or bad; but sometimes how we live with them is. It's kind of like speed. I like to be able to drive fast enough to get to places on time, but too much speed is dangerous. Carbon dioxide, along with water vapor, maintains our planet at a nice temperature so that is good. Mass injections of anthropogenic CO₂ into the atmosphere may upset a delicate balance in nature, and the result would probably be good for some people and bad for others. For example, if CO₂ continues to warm the planet, heating bills in the north would likely decrease which would be good for them, but air conditioning bills in the south would likely increase, which would be bad for them. There could also be better growing conditions in some agricultural regions but droughts in others. My job is to monitor what is going on, and to suggest ways to head off any bad consequences of any climate change. Generally speaking, people are not used to change so the current opinion is to minimize it by keeping CO₂ levels about where they are, or perhaps to reduce them a bit. This does not pass judgement on CO₂, other than to say we like just the amount of it we have, or maybe the amount we had a few years ago. Finally, reducing fossil fuel

CO₂ emissions could also lead to reduced energy demand and lower energy bills. This is generally considered to be good. TJ Blasing

Q Hello! This is a great website! I'm glad that SOMEBODY wants to stop Global Warming! Well, anyway, would you like to make a partnership with us? A partnership is where I put your link on my website, and you put my link on your website! To respond you may either contact us using email (editors@save-planet.org) or click <http://www.save-planet.org/commentsuggestion.htm>, to apply to make a partnership click <http://www.save-planet.org/partnership.htm>. Oh, and our website is www.save-planet.org. Thank you, and DOWN WITH GLOBAL WARMING -SaveR-Planet (8/1/08)

A Dear SaveR-Planet Editors, We appreciate your recent offer submitted to the CDIAC web site. You are welcome to link to our site. We will review your site and evaluate whether it is appropriate for us to link to it. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I would like to set up a website that pings your assessment of CO₂ concentration via SOAP or other means. Is a SOAP service for your current CO₂ concentration in ppm available? If not, what can we do to set this up? (7/31/08)

A Dear Nate, We do not have a SOAP mechanism set up to exchange our CO₂ assessments. I admit I am ill-informed about the XML protocol so any information you could offer to help me evaluate this capability would be appreciated. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I have recently come across data from the latest UNDP Human Development Reports sourced to CDIAC. It is Figure 1.1 in the 2007/2008 Report (copy/pasted below), and the charts are entitled "Rising CO₂ emissions are pushing up stocks and increasing temperature". It is sourced to: "CDIAC (Carbon Dioxide Information Analysis Center). 2007. Correspondence on carbon dioxide emissions US Department of Energy, Oak Ridge National Laboratory Tennessee". Do you have the back-up data for this figure? Thank you in advance (7/30/08)

A Dear Douglas, We were not responsible for the title on the UN figure or table but we did provide underlying data to the UN. For example, global estimates of CO₂ releases from fossil fuel use may be found on our web site at http://cdiac.ornl.gov/trends/emis/tre_glob.html. Long-term global temperature departures may be found at http://cdiac.ornl.gov/climate/temp/temp_table.html. I am not quite sure what the UN meant by "stocks". Certainly the reservoir of carbon stored in the atmosphere has increased over time and you will find these records at CDIAC too. If they meant forest carbon stocks (i.e., increased biomass) you can look under "AmeriFlux" on the CDIAC web site for changes in stocks at different flux towers throughout North America. Please contact us if you need additional assistance. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q > I have recently come across data from the latest UNDP Human Development Reports sourced to CDIAC. It is Figure 1.1 in the 2007/2008 Report (copy/pasted below), and the charts are entitled "Rising CO₂ emissions are pushing up stocks and increasing temperature". It is sourced to: > "CDIAC (Carbon Dioxide Information Analysis Center). 2007. > Correspondence on carbon dioxide emissions US Department of Energy, Oak Ridge National Laboratory Tennessee" > > Do you have the back-up data for this figure? > > Thank you in advance > > Regards, > Douglas Gilman (7/30/08)

A Hi, I saw no figure attached to your email, but went to the report and saw a 3-panel plot of temp, CO₂ concentrations and CO₂ emissions. The links that will take you to further explanation and actual data include <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> (see sections 1, 2, and 3 especially) <http://data.giss.nasa.gov/gistemp/graphs/> <http://cdiac.ornl.gov/trends/temp/jonescrj/jones.html> (for this page click on the "CRU temperature data web pages" link for the most up to date data; this site seems to be down at the moment) (The temp data discussed in IPCC reports include several records including the Hansen et al. and Jones et al. data at the links above.) <http://cdiac.ornl.gov/trends/CO2/sio-keel.html> <http://scrippsco2.ucsd.edu/data/data.html> (Mauna Loa is most cited site. Our CDIAC pages don't have the most up to date data from Keeling et al., thus the Scripps link (the true source).) <http://cdiac.ornl.gov/trends/emis/overview.html> See the global data; again, online we don't have the most up to date data; those would be in some sense preliminary. Our experts here don't like to post things until things are really solid, as the data used to produce the inventory come from a number of sources that are somewhat tricky and dynamic to work with. Dale Kaiser CDIAC

Q What is the difference between your "Carbon Dioxide from Fossil Fuel Burning" (http://cdiac.esd.ornl.gov/trends/emis/tre_tp20.htm) and UNFCCC's "CO₂ Emissions" (http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3814.php)? For example, your 1990 figure for the United States is 1,315,008 thousand tons of carbon; compared to the UNFCCC figure of 5,061,634 thousand tons of carbon emissions for the US for the same year. Thank you for your help. (7/29/08)

A The UNFCCC number is in tons of carbon dioxide whereas ours is in tons of carbon. Multiply your number by the ratio of the molecular masses (44/12 = 3.67) and you should get close to the UNFCCC number. Gregg Marland

Q Not too long ago I saw a list of carbon dioxide emissions by countries per capita on Wikipedia which has been lifted from your website. Going back today, I cannot seem to find it. Is it still available on this site? If yes, could you kindly provide me the link for this? Thanks (7/26/08)

A Here is the link to our site: http://cdiacornl.gov/trends/emis/em_cont.htm These numbers are always being revised as per new data or correction of problems with the old data, so I would encourage you to use our website directly for the "latest numbers" TJ Blasing

Q I'm wondering how I can find out about how many sites there are worldwide that measure CO₂? I understand there are about 400 sites worldwide that are connected with FLUXNET. Would all of these sites measure CO₂? Are there others measuring CO₂ that aren't part of that network, like NOAA, TRAGNET, NASA? In other words, do some of these networks overlap with each other? (7/21/08)

A Dear Diane, We appreciate your question to the CDIAc web site. To the best of my knowledge, there are ~400 flux towers worldwide measuring carbon dioxide fluxes (e.g., into and out of a forest site). Of course, the number of sites changes regularly but the ~400 estimate does include sites sponsored by NOAA, DOE, NASA, USFS and international funding sources. You can find a listing of the sites in the US on the AmeriFlux section of the CDIAc web site. If you are referring to the number of sites that routinely monitor atmospheric levels of CO₂ in order to determine long-term, background levels, the number of sites is fewer (~100-150). The majority (50-75) are run by NOAA's Earth System Research Laboratory. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q I'm looking for data to support the replacement of R11, 12, 22 in all the commercial chillers in Portland Oregon (7/21/08)

A Hi Michael, Your request for information about R11, 12 and 13 was forwarded to me. Sorry for the delay in getting back to you, but I've been on vacation. On the main CDIAc web page (<http://cdiacornl.gov/>), under the "Subject Areas" on the right side of the page, is a link to "Atmospheric Trace Gas Measurements" <http://cdiacornl.gov/tracegases.html>. On this page is a list of various greenhouse gas compounds that includes "Chlorofluorocarbons". Under the "Chlorofluorocarbons" link are several CDIAc products. The link to the Blake document/data might be useful (<http://cdiacornl.gov/trends/otheratg/blake/blake.html>). Please let us know if we can be of additional assistance. Good luck, Les Hook

Q Hi, I'm wondering how one would suggest reconciling the more recent global CO₂ emissions with the previous national level estimates. The new global estimates are considerably lower than the aggregated totals from the national data. Thank you, Kevin Ummel (7/18/08)

A Kevin, I don't quite understand the question. The data are revised every year and both country totals and global totals will change as energy data are revised. If you use national and global totals from the same data release, this should not occur. To the contrary, the global totals tend to be larger than the sum of the country data. There are 4 reasons for this. Most important is that country totals do not include emissions from fuels used in international commerce, whereas these are included in the global totals. Also, globally the sum of all exports tend to be different than the sum of all imports (data quality problem), at the global level we assume that there is no change in stocks of stored fuels, whereas many countries do have values for changes in stocks (fuels produced but not burned in a year), and the estimates of oxidation of non-fuel hydrocarbons (asphalt, lubricants, solvents, etc.) are treated differently at the global and national levels. Let me know if I have written all of this without getting to your real question. Gregg

Q I have a question about your FAQ comment that says we do not have to take into account the CO₂ that humans expire when totalling the anthropogenic CO₂ in the atmosphere. You justify this statement by reasoning that "that carbon dioxide includes carbon that was originally taken out of the carbon dioxide in the air by plants through photosynthesis - whether you eat the plants directly or animals that eat the plants. Thus, there is a closed loop, with no net addition to the atmosphere." BUT WAIT A MINUTE - aren't fossil fuels the remains of plants that took their carbon out of the air in photosynthesis? This fact makes your argument for ignoring human expiration invalid. I take exception to your contention that we can ignore human population growth. By my calculation, human population growth has added 110 PgC to the atmosphere since 1850, thus contributing 20% of the 174 PgC increase (7/17/08)

A Dear David, I am sorry I did not respond to your comment sooner regarding our treatment of human respiration in our FAQ section. I think the important distinction is whether one is considering changes in carbon stocks and pools or considering carbon cycle processes and fluxes. From a process standpoint, your comment is correct and our FAQ response does shortchange the importance of human respiration and other processes as well (e.g., plant photosynthesis and respiration during the growing season). I believe the point the FAQ response was trying to make was that over longer time intervals (decades, centuries) and at the global scale the predominant human activities impacting large carbon pools have been fossil fuel use and land-use behavior, and not human respiration. Thanks again for your comment and we will revisit our answer to better articulate these distinctions. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I have found on wikipedia a list of carbon dioxide emissions for countries around the world in 2004 and its states the data is held by you. I am looking to use the data in my dissertation and was hoping you could help me in the way of how to reference the data set? Thanks in advance (7/15/08)

A Glenn <http://cdiac.ornl.gov/trends/emis/overview.html> Starting at this page you have access to all of the data, and at the very bottom of the page it suggests how to cite the data. Since you are working on a research project I should tell you that we have some preliminary data for 2005 and 2006 that we could share with you if it would be useful. We are also working actively on the 2005 data and should have it before you get too much farther in your work. Gregg Marland

Q Do you have a map of the US showing CO₂ emissions from power plants? (7/14/08)

A Go to this site and see if that map is good enough; it was updated last week. You can snap it right off the web, but EIA always appreciates the credit. <http://tonto.eia.doe.gov/state/> TJ

Q I am interested in finding a CO₂ meter that can be placed in a microbiology incubator. Do you know of any manufacturer? Thank you Marty (7/14/08)

A Dear Marty, I am neither a microbiologist nor an instrument person, however, you might scan some of the vendors and web sites listed at <http://public.ornl.gov/ameriflux/resource/equip-tips.shtml> I hope this helps. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hello. Just want to ask, why there are no updated data series stored in your database? Most are about 10 years or older, at max there are files up to 2004 or so. Isn't there any update? Thanks a lot. (7/13/08)

A Dear Pit, It could be any one of a number of reasons, depending on which data set you are talking about. Many are from experiments that only last for a few years before funding runs out. Some are politically sensitive and require a lot of scrutiny. Some are simply difficult to update and/or we just don't have the personnel to update the records as quickly or as often as we would like. We are currently developing a plan to fix the last problem. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q The AMS is developing a national pre-college teacher enhancement course. I am seeking information to determine if there is (or is it feasible to attempt) a simple investigation in which one could demonstrate temperature elevation via IR absorption. My idea would be to have two identical IR-transparent beverage bottles or food containers, one filled with air and the other with carbon dioxide, equally exposed to sunlight or IR source. I'm wondering if such a setup would result in significantly different temperatures in the two atmospheres. Has any of your group heard of such a thing? (7/9/08)

A Dear Ira W. Geer, Never heard of that one before. If both containers are IR transparent then IR radiation would pass through them equally as soon as the molecules they each contain become excited. It might be possible to put thermometers near the center and near the edge (but also inside) of each (BIG) bottle and get a large enough temperature gradient in a bottle full of CO₂, to show up as a higher temperature near the center of the CO₂-filled bottle and a lower temperature near the edge. Also, when filling the "control" bottle I would put in very cold air so as to remove as much water vapor interference as possible. I would be interested to see how such an experiment would turn out. We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q Dear CDIAC, I hope you may have a press office and that you can help me establish whether CO₂ emissions generally equates to 'Fossil-Fuel CO₂ emissions' as measured in your data. I would be very grateful to speak to someone today as soon as possible about measures of CO₂, for presentation of data in the newspaper. Regards (7/8/08)

A Dear Caroline, I hope your newspaper piece went well and thank you for your query to the Carbon Dioxide Information Analysis Center web site. A few quick clarifying points. Anthropogenic CO₂ emissions generally refers to two sources - releases from the combustion of fossil fuels and releases due to changes in land-use practices (e.g., converting a forest to an agricultural field). Atmospheric measurements of CO₂ reflect all sources of CO₂ including anthropogenic and biological sources (e.g., plant respiration) but atmospheric measurements of carbon isotopes (C13 & C14) help in elucidating the various sources of the CO₂ to the atmosphere. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hi, I'm working on some emissions data for our work based on your data, and after looking around a little more I noticed that CDIAC and EIA values of CO₂ emissions from fossil fuel combustion are different. I'm under the impression that both CDIAC and EIA are under DOE. Shouldn't they be the same? After reading the methodology used in the EIA emissions inventory it seems like the process is the same as with CDIAC calculations. Why are the fossil fuel CO₂ emissions different in these two databases? It isn't solely because of different coefficients, is it? Thank you for your help. Best, Amanda (7/8/08)

A Amanda, We have been estimating CO₂ emissions for nearly 30 years based on energy data from the United Nations. The EIA started making similar estimates sometime in the 1990s and based on their own energy data. And the big difference is really in the energy data. There is no link between the two data sets aside from the fact that we occasionally peek to see their numbers and

they must do the same to ours. As you understand there is considerable uncertainty in the amount of fossil fuel used around the world. Our estimate is that the uncertainty in the global total of CO₂ emissions number is on the order of 10%. And the numbers you use for other sources of greenhouse gases have even greater uncertainty. We are actually doing an exercise to compare CO₂ estimates from different sources and different years to see if this helps us to understand the uncertainty in the numbers in a quantitative way. Gregg

Q Do you have any data on carbon dioxide concentrations in the atmosphere versus altitude (say, ground or 1,000 feet up to, say 20,000 feet)? (7/7/08)

A Dear Richard Greeley, Probably your best bet would be to check the elevations of the sites at which CO₂ is monitored. Mauna Loa is well over 3000 meters above sea level and nearby Kumukahi is about 3 m above sea level. Measured concentrations are similar, indicating as we would expect, that the air in the troposphere is well mixed so that CO₂ concentrations tend to be the same at all elevations. Leakage to the stratosphere occurs more slowly, so stratospheric concentrations lag (are somewhat smaller than) tropospheric concentrations. Sincerely, TJ Blasing

Q Given that carbon dioxide is heavier than air, why isn't the surface of the globe higher in concentration of CO₂ than higher altitudes? In other words, why isn't there a layering of gases by altitude of gases according to their weights? Thank you (7/7/08)

A Dear Robert Pettengill, The reasons are the same as those for fine particles (much heavier than CO₂ molecules), being abundant at high altitudes so that water vapor can condense on them and form clouds. In convection, warm air rises and carries material with it. If that material is not settling out faster than the air is rising, it will rise also. Because the troposphere is well mixed, the distribution of the various types of gas molecules is constant, except for water vapor (relatively light by atmospheric molecular standards) which condenses to form raindrops. Some of these drops are light enough that they can stay suspended in clouds, but some get much heavier and fall out as rain. So, water vapor does decrease with height even though it is "lighter than air" because it has a "removal mechanism." We appreciate your question to the CDIAC Web site. Sincerely, TJ Blasing

Q I am working in an analysis of CO₂ inventories in Angola and I have been consulting several sources (Energy Information Administration "EIA", International Energy Agency "IEA", CDIAC, etc.) I am writing because I have found a lot of differences between these sources, but the principal was the quantity of CO₂ from flaring gas natural. CDIAC estimates that CO₂ emissions in Angola from consumption of Natural Gas in 2004 was about 383 thousand tons of Carbon equivalent (1.404 million tons of Dioxide Carbon) and the CO₂ emissions from consumption and flaring of Natural Gas was about 792 thousand tons of Carbon equivalent (2.904 Million tons of Dioxide Carbon). So, the CO₂ emissions from flaring gas natural was 1.5 million tons of Dioxide Carbon. EIA estimates that the consumption in Angola of Natural Gas in 2004 was about 1.46 million tons of Dioxide Carbon, just the same than CDIAC, but the CO₂ emissions from flaring and consumption of Natural Gas was about 12.75 million tons of Dioxide Carbon. So, the CO₂ emissions from flaring gas natural was 11.3 million tons of Dioxide Carbon. CDIAC Website says that the sources on which your information is based are EIA and UN Data. My question is, How is this difference between both sources possible? What means "flaring of natural gas" exactly for CDIAC? Maybe EIA included within "flaring" some aspects that CDIAC didn't take into account. Could you send me more information about your methodology to estimate CO₂ emissions related to natural gas? Thank you in advance (7/4/08)

A So far as I am aware, the CDIAC and EIA definitions of gas flaring and the methods for calculating emissions are virtually the same. The difference is in the data on how much gas is flared each year. We use data from the UN and I am not sure where the EIA gets data on international gas flaring. It will not surprise you to learn that there are large uncertainties in some of the international energy data, and data on gas flaring are particularly bad. Because there are not markets or taxes involved, the data on flaring are notably poor. From where we sit, there is little we can do on gas flaring other than to use international data, hope for the best, encourage the international agencies to be diligent in collecting the best estimates available, to run some data checks for obvious inconsistencies, but know that the uncertainty is quite large. I am aware that this is not a very satisfactory answer to your question, how can we be helpful? I might add that, fortunately, there are not a lot of countries where this gas flaring is a serious issue: Angola, Nigeria, Norway, ... Our best, Gregg

Q Your date starts from 1750 to 2003. How did you know the CO₂ emissions in 1750? (7/3/08)

A All of the estimates of CO₂ emissions are based on estimates of fossil fuel (coal, oil, and natural gas) consumption. The United Nations has statistics on fossil fuel consumption back to 1950, but others have used historic data to construct estimates of fossil fuel use all of the way back to 1750. If you would like detailed references to some of this historic literature, we can probably help. Our data actually go to 2004 on the web site and will soon be updated to 2005. We have preliminary estimates for 2005 and 2006 now, if these would be useful to you and will have a preliminary value for 2007 within a couple of weeks. Our best, Gregg Marland

Q To your knowledge, has anyone produced a formulaic correlation between atmospheric CO₂ and temperature? That is, a formula which translates CO₂ levels to temperature effect? I suppose this might be as simple as statistically crunching the Vostok or similar data, but perhaps someone has done this or a more sophisticated analysis? (7/2/08)

A Dear Eric Michelman, No. This is because there are several other factors that determine the near-surface air temperature including some interactive factors that occur at various lag times. For example, CO₂ increases may cause the temperature to rise, but then ice melts and less sunlight is reflected so that more energy is available to raise the earth's temperature. Clouds are another factor that complicates the issue. Therefore the only way to realistically estimate climate responses to future carbon dioxide increases is to use general circulation models of the atmosphere which give a range of answers depending on assumptions about how ice, clouds, land cover etc., respond to climate warming of various magnitudes. Much effort has been spent on this, and the results suggest that 2-5 degrees (Celsius) warming would result from a doubling of CO₂ if all other factors remain constant. We appreciate your question to the CDIAAC Web site. Sincerely, TJ Blasing

Q I am working on an in-house unfunded research project involving the developmental history of H₂S measuring instruments. I have written a problem statement which I would like to send to you via e-mail; but, I don't know how to attach it to this e-mail. Please send e-mail contacts so I can send to you to see if your organization may have materials which might be helpful to me. Many thanks in advance (6/28/08)

A Have you tried the Gas Research Institute? Gas Research Institute (GRI), Gas Technology Institute (GTI) 1700 S. Mt. Prospect Rd. Des Plaines, Illinois 60018-1804 Phone: 847/768-0500 Fax: 847/768-0501 Web Address: <http://www.gri.org> John Riordan, President. They would need to measure anything they add to gas, I would think. TJ Blasing

Q Dear Director, I would like to inquire about an internship opportunity with Carbon Dioxide Information Analysis Center for the Summer of 09. Sincerely, Samantha E. Ciepiela (6/25/08)

A Dear Samantha, Thank you for your interest in a possible internship with the Carbon Dioxide Information Analysis Center (CDIAC) for 2009. We host students every year including this year and certainly expect to have students in 2009. I suggest you do two things to move along the prospect of an internship here in 2009. First, please send me an updated resume. Secondly, I encourage you to review the different educational programs available at our laboratory and consider applying to one for 2009 (<http://www.ornl.gov/orise/edu/ornl/default.htm>). Should we decide there is a good match between your interests and skills and the projects CDIAC will be working on in 2009, by applying to one of the DOE internship/fellowship programs will make the transition much smoother. In addition, by applying to one of these programs you will be considered for an internship across the entire ORNL system, not just CDIAC. Sincerely, Tom Boden, Director Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I have just been looking at the graphics on Monthly Atmospheric ¹³C/¹²C Isotopic Ratios for 10 SIO Stations and for Baring Head New Zealand. It shows the graphics for Somoa (6/25/08)

A Dear Lucy, Thank you very much for informing us that we were pointing to the wrong file! The problem has been fixed thanks to your willingness to take the time to notify us. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Could you direct me to a source for Fuel Conversion Factors for converting ppm of CO₂ to lbs per MMBtu? Thanks for your help (6/24/08)

A Neal: Carbon coefficients for the various fuels are given in Tables A-29 and A-30 of EPA's Inventory document http://www.epa.gov/climatechange/emissions/downloads/08_Annex_2.pdf Units are Teragrams of carbon per Quad, which translates to grams of carbon per 1000 Btu. One teragram of carbon (as CO₂) = 0.469 parts per billion (0.000469 ppmv) CO₂ when the CO₂ is mixed evenly throughout the earth's atmosphere. Convert all carbon dioxide to carbon (divide by 3.667) first or this won't work. i.e., 1 Tg of carbon dioxide = 0.128 ppbv, or 0.000128 ppmv, of CO₂. TJ

Q Dear Colleague, I am trying to access a paper on forest carbon distribution in SE Asia. The reference for the paper is given in Gibbs et al 2007 "Monitoring and estimating tropical forest carbon stocks" as: Gibbs H K and Brown S 2007b Geographical distribution of biomass carbon in tropical southeast Asian forests: an updated database for 2000. Available at <http://cdiac.ornl.gov/epubs/ndp/ndp068/ndp068b.html>. However, the response when I use this URL is a 404 error! I would appreciate it if you please send me the paper by email. Many thanks, Sean (6/19/08)

A Sorry this took so long. I just got a copy of your request this morning. TJ ++++++ (Terence J.) TJ Blasing Carbon Dioxide Information Analysis Center Building 1509 Oak Ridge National Laboratory Oak Ridge, TN 37831-6335 ----- Ph: (865) 574-7368 FAX: (865-574-2232) E-mail blasingtj@ornl.gov

Q In this website (http://www.ccas.ru/tarko/CO2_e.htm#7) they refer to your institution as the source of the following information ----- 7. Carbon Dioxide Budget of Biosphere Calculations show that the CO₂ flows balance of in the world

possible, more recent information) Thanks in advance Jesus Rosino jesusrosin@hotmail.com (6/19/08)

A | The approximately 6.2 Gt of fossil fuel emissions include transportation, residential, and commercial applications as well as industrial applications. Also, a quick glance at some CO₂ concentration data suggest that more than 3.3 Gt-C as CO₂ stayed in the atmosphere in 1995. I don't know where the figures came from. I'll put this past some of my colleagues and see what happens
TJ Blasing

Q | We would like to use the graph of 'Past and projected atmospheric carbon dioxide concentrations (2001)' in our Derbyshire Climate Change Strategy. I can't paste the graph into this question box. I hope you know which one I refer to. The citation beneath the graph is currently: Source http://www.townplan.org/images/CO2_1ce.png. Data for this graph comes from the Carbon Dioxide Information Analysis Centre cdiac.esd.ornl.gov. Firstly, do we have permission to use the graph (it is the best we've found for our purposes on the internet) and secondly, is this the correct citation to use please? An early reply would be very much appreciated because of deadlines we have to meet. Many thanks for taking the time to consider this request Maggie (6/19/08)

A | Dear Maggie, Thank you for your questions submitted to the CDIA Center web site. You have our permission to use the plot which incorporates data distributed by our data center. One minor correction to the citation: Past and present CO₂ concentrations come from our data center. We do not distribute model or statistical projections. Please make this distinction clear in your citation or acknowledgement. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | There seem to be one little typo on this page. The word "sources" has been misspelled http://cdiac.ornl.gov/oceans/ndp_088/ndp088.html (6/17/08)

A | Dear Esa Peltola, Thank you very much for alerting us to this typo. It has been fixed. Regards, Fred Baes

Q | Mantra Venture Group Ltd. 1205-207 West Hastings Vancouver, B.C. V6B-1H7 www.mantraenergy.com I would like to introduce Mantra Venture Group. We have noticed that you are involved in the CO₂ market and we would like to build a relationship with your team and networks. We see ourselves as having an exciting new technology for dealing with Carbon Dioxide. Let us introduce ERC (electro-reduction of carbon). This is our flagship technology and we will explain what it is and how it is important to the world. What does ERC do? ERC uses CO₂ as a raw material and puts it thru an electrical process that converts CO₂ into formic acid, a useful chemical. The CO₂ does not resurface as it then goes into finished products of all kinds. We plan to go further and develop a fuel cell that will run on formic acid; this gives us a closed loop process. CO₂ in, conversion into a fuel, use of the fuel for energy and recycling of the CO₂. Round and round! Renewable, sustainable! There is a competitor called sequestration or CCS, carbon capture and storage. It is another way of dealing with exhaust gas from power utilities and industries. Projects are in the early stages in Australia and the UK; the US had the FutureGen CCS project but cancelled it 2 months ago as its cost soared above \$1.5 billion. What does CCS do? • Captures CO₂ from a smoke stack, from exhaust • The gas is injected far underground into a stratum that will contain it forever. Just from the description it sounds expensive. Some utilities have guessed that customer's bills will increase by 10% minimum. These injection sites will have to be monitored for many years to guard against a catastrophic release of the gas. Pundits expect that CCS will be in use by 2030 and in common use by 2050. The power utility industry around the world is looking to CCS as the future answer, and they have to have an answer! ERC has these advantages: • It is less costly to install, to run and its product offsets the cost, whereas CCS is costly and will drive up the cost of electricity • At a cost of under \$100 million we can have ERC in the marketplace, not the multi-billion dollar budgets for CCS • ERC can be built small as a demonstration project and scaled up to meet the industrial client's needs. CCS, not! • ERC is projected to be available within 12 months with industrial plans available in the 24 to 30 months. CCS will take many years to become accepted in industry. Work is underway on optimization of ERC at our lab now. We are working on demonstration equipment first, and a 100 tpd plant will follow, then a 600 tpd plant. The fuel cell will be developed in parallel. Our plan is to release the two products in 24 to 30 months, all going well. ERC does share one thing with CCS, the market, and the CCS market is projected to be hundreds of billions of dollars in 2030 and beyond. We are looking forward to building a relationship with your company and networks. Please let me know how we can work together. Sincerely, kol henrikson (6/17/08)

A | Dear Kol, We appreciate your comment/feedback on the CDIA Center Web site. Good luck with implementation of the ERC. To help me understand the process better, what are the finished products where your CO₂ ends up and could you elaborate about your recycling of the CO₂? You too may be simply practicing CCS of another form. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center

Q | Hello, I know you're doing tons of stuff at Oak Ridge, and this may seem menial...but I cannot find a good breakdown of how the U.S. produces its CO₂ (electricity is x%, automobiles is y%, home heating in the NE is z%, etc). By "good" I mean from a reputable source. If you can point me to something that would be greatly appreciated. Thanks John (6/13/08)

A | Dear John Del, By region and sector, you can get the 2005, 2006 values pretty close on the National Energy Modeling System site http://www.eia.doe.gov/oiaf/archive/aec07/supplement/sup_t2t3.xls. Sincerely, TJ Blasing and: Dear John Del, By region and sector, you can get the 2005, 2006 values pretty close on the National Energy Modeling System site http://www.eia.doe.gov/oiaf/archive/aec07/supplement/sup_t2t3.xls. Sincerely, TJ Blasing

I | Greetings My name is Sandra Ledesma I am working on the NCHP (Nile Countries Hydro management project) and the subject

Q I would like to know if you could supply to me this digital map or where to obtain it. I will be really grateful for your help. If in the future I can help you in some way with the results of my project, please don't hesitate to advise me, I will be pleased to do it. I hope my request doesn't disturb your work. Thanks for take care of my request and for your time. Best Regards Sandra Ledesma
CPL Computational Physics Laboratory EPF Ecole d'Ingénieurs Sceaux, France (6/12/08)

A Hello Sandra, Good, current land use information is difficult to come by. I could recommend some global land cover map products (like GLC2000 or MODIS data), but they will not have the detail and use/condition information that you require. You might try <http://earlywarning.usgs.gov/adds/index.php> which is the Africa Data Dissemination Service (ADDS) website. They are a part of the Famine and Early Warning System Program. I'm not certain how current their information is, but they may be a good resource for you. My other recommendation would be to check with FAO, specifically the country profiles and mapping information system (<http://www.fao.org/countryprofiles/index.asp?lang=en&iso3=ETH&subj=5>) I'm not certain you'll find one land use layer that will meet your needs, but you may be able to piece together what you need with land cover, ecological zones, forest cover, and agriculture data. Good luck with your research. Sincerely, Lisa Olsen CDIAC

Q I need help in locating a mirror that belonged to my grandfather, Joe Harnois, Beauharnais. The person who has the mirror does not know that there are important papers inside the frame of the mirror and LOCATING THESE PAPERS IS AN EMERGENCY!! If you have any bulletin boards, please post this message. I live in Oak Lawn, Illinois. THANK YOU! (6/12/08)

A Dear Jackie, Not the type of comment we usually get on our web form. I hope you find the mirror and, more importantly, the papers. Please let us know if you do. Sincerely, Tom Boden

Q I am presently working on a Paper Presentation regarding the usage of CO₂ gas as a heat blanket. My question is that how far is it effective in storing CO₂ for a long time when it is circulated in pipes? Can CO₂ be stored for longer times without having to replace the existing CO₂ within the pipes or do we have to continuously change the gas? (6/11/08)

A Dear Mr. Arunachalam, I am afraid that you are reaching into an area where CDIAC does not have data or expertise. We wish you luck in your enquiry and are sorry that we are not able to be helpful at this time. Gregg Marland

Q I am looking for global CO₂ emission rates, historically from 1990, and projected up to 2030. I'm having trouble finding it on the website. Thank you. (6/10/08)

A Dear Sagar, We appreciate your question to the CDIAC web site. Our data center does not offer global fossil fuel CO₂ emission projections, only time series based on actual energy production and trade data. Our global fossil fuel CO₂ emission estimates through 2004 may be found at http://cdiac.ornl.gov/trends/emis/tre_glob.html. Projections of future global fossil fuel CO₂ emissions have been published by the Intergovernmental Panel on Climate Change (IPCC). Data tables from these model runs may be found at <http://www.grida.no/climate/ipcc/emission/164.htm>. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

[from Gregg Marland] On our web site you will find data that cover from 1750 to 2004. We can send you preliminary data for 2005 and 2006 if that would be helpful. By the end of June we will have updated numbers for 2005 plus preliminary data for 2007. For projection to 2030 I suggest the web site of the International Energy Agency and look at their publication called World Energy Outlook. I am having computer problems today, but if you have trouble finding any of these sites, let me know and I should be able to sort things out here. Cheers, Gregg

Q What is the current estimate of measured total CO₂ output, globally speaking? Total combined including human, ocean, volcanic and all other sources (6/4/08)

A Dear Dane, We appreciate your question to the CDIAC Web site. I will be sending you a slide with a diagram of the global carbon cycle. It deals with carbon in carbon dioxide, but if you want to get numbers for carbon dioxide you have to multiply the numbers in the diagram by 3.667. If you know some chemistry, the atomic weight of carbon is 12 and for oxygen it is 16. The CO₂ molecule has one atom of carbon (12) and 2 of oxygen (2X16=32) so the total mass is 12+32=44. For carbon only it is 12, therefore to get from carbon to carbon dioxide, multiply carbon by 44/12 (= 3.667). Finally, I hope this didn't insult your intelligence too much, but I never know the background of the people sending these questions, so I like to keep answers as simple as possible. This diagram does not include volcanoes. There is an obscure paper by Gerlach on this subject: Gerlach, T.M., 1991, Present-day CO₂ emissions from volcanoes. *Eos, Transactions American Geophysical Union*, Vol. 72, No. 23, June 4, 1991, pp. 249, and 254-255. Volcanoes release somewhere around 200 Tg-CO₂ into the atmosphere every year. The figure varies from year to year depending on Pinatubo and other large volcanic events. For comparison with the slide I'm going to send separately, 200 Tg is 0.2 Pg. 1 Teragram (Tg) = a million metric tons, 1 petagram = 1000 teragrams. Again, I apologize in advance if some of this material seems overly simplistic. Sincerely, TJ Blasing

Q When will data for 2005, 2006 and 2007 be available? (6/4/08)

A Here are some preliminary data for 2005 and 2006. Within a month we should have full data for 2005, an update for 2006, and a preliminary estimate for 2007. Send me an e-mail reminder around the end of June and we will share whatever we have at that

time. Thanks for your interest, Gregg

Q Hello, I heard somewhere that there is a new version of the CO₂ SYS program. Where can I download this new version? Thank you very much in advance. With best regards, Andreas Hofmann (6/2/08)

A Dear Andreas Hofmann, Yes, we have updated version of CO₂ SYS program available at: <http://cdiac.ornl.gov/oceans/CO2rprt.html>. There you can also use the new the CO₂ sys_macro_PC.xls or CO₂ sys_macro_MAC.xls Program for MS Excel. Please let me know if you have any questions. Regards, Alex Kozyr.

Q My question is an extension of Q #20. **Q:** What kinds of radiation pass through the atmosphere and what kinds are absorbed? **A:** "This is in contrast to the infrared (wavelengths greater than about 0.75 micrometer) radiation emitted by the earth's surface. This radiation has wavelengths mostly between about 2 and 20 micrometers and over 90% of it is absorbed by water vapor, carbon dioxide, methane, ozone, nitrous oxide, fluorocarbons and other radiatively active ("greenhouse") gases on the way up". "Radiatively active gases are active in specific wavelengths of radiation. For example, if we could see in the infrared spectrum between 5 and 8 micrometers we could not see the earth's surface (even on a clear day) from an aircraft at 10 km altitude. This is because water vapor is "opaque" in those wavelengths and there is water vapor in the atmosphere even when there are no clouds." I assume that: (a) collision is a precondition for absorption, (b) the IR visibility of the surface from the top of the troposphere varies with the concentration of water vapour in the atmosphere and (c) trace gas molecules in a parcel of atmosphere are separated by distances many multiples of their diameters, suggesting that the likelihood of collision is low. I understand that the surface IR flux is ~390 Wm⁻² per second. Could you tell me how to compute how much of this is absorbed in the atmosphere, please? Thank you, John Millett (6/1/08)

A Dear John Millett, I'm going to take your question literally and assume the absorption is what you want to compute. I have never done any of these kinds of calculations except for some hideously simple ones many years ago, so you might need to find a local meteorology department and get their radiation expert for direct help. I am going to send you an e-mail of the simplest and most complete paper I have found on the subject so as to get you started. However, I haven't yet figured out how to attach anything to these canned answer forms, so I will send it along separately. We appreciate your question to the CDIA Web site. Sincerely, TJ Blasing

Q Why are the CDIA CO₂ per capita emission statistics so dramatically different from the United Nations stats (<http://cdiac.esd.ornl.gov/home.html>) that say they are based on CDIA data? Ex: US per capita emission 2004 CDIA - 5.61 UN - 20.3792. Thanks very much. (6/1/08)

A UN numbers are as tonnes of CO₂, CDIA numbers are as tons of carbon contained in CO₂. The two are related by the ratio of the molecular weights, i.e. 44/12 = 3.67. So multiplying the CDIA numbers by 3.67 should give the UN numbers. Cheers, Gregg

[from TJ] A common problem with interpretation of CO₂ data is that some groups like us, measure only the carbon in the CO₂ molecule while others also include the oxygen. When the oxygen is included the molecule is (carbon + oxygen)/(carbon only) = (12 + 32)/12 = 44/12 heavier. 5.61 X 44/12 = 20.57 which is pretty close to 20.61. TJ Blasing

Q Hello, I need help tracking down a reliable source for carbon emissions. This is for a possible advertising campaign. I need to know how much CO₂ the United States emits on a daily, weekly and annual basis. Same for the World. Any guidance is much appreciated. My deadline for the client is Wednesday of next week (June 4th.) thank you, Jen Hahs (5/30/08)

A Dear Jennifer, We appreciate your question to the CDIA Web site. Our global and national annual fossil fuel carbon release estimates may be found at <http://cdiac.ornl.gov/trends/emis/overview.html>. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q Hello there, I am wondering if 1878 is the earliest recording of the emissions from fossil fuel, cement manufacture and gas flaring? Or are there earlier recordings? and in what year did global warming become a global issue? (5/28/08)

A Dear Marianna, We appreciate your question to the CDIA web site. The earliest record of CO₂ releases from fossil fuel use we have is for the UK in 1751. The UK time series, beginning in 1751, may be found at http://cdiac.ornl.gov/trends/emis/tre_uki.html. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am a student in Oregon and am trying to locate the source for the assertion that the world's oceans currently hold about 38,000 PgC. I have seen this data in numerous articles and can't seem to track down the source. Any ideas? Thanks (5/27/08)

A Dear Katie Dailey, We appreciate your question to the CDIA Web site. According to our local expert on these matters, Alex Kozyr, Takahashi T. 2004. The Fate of Industrial Carbon Dioxide Science, Vol. 305, no. 5682, pp. 352 - 353. DOI: 10.1126/science.1100602 <http://www.sciencemag.org/cgi/content/full/305/5682/352> would be a good source. Sincerely, TJ Blasing

[from Lianhong Gu] Katie, This number is about right. See page 528, Section 7.3.4.1 in the following citation (Note that 1 PgC = 1 GtC): Climate Change 2007: The Physical Science Basis Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

[Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge United Kingdom and New York, NY, USA. Lianhong

Q Dear Sir or Madam, I am a graduate student in Yunnan University, China. Now I mainly focus on the research about the cloud. So I want to know whether do you have the information about the stations used in NDP026D. If you have, would you like to send a copy for me? Thank you very much for your assistance. Sincerely, Yale, You (5/26/08)

A Dear You, Please see: <http://cdiac.ornl.gov/ftp/ndp026d/> Click on the folder "cat01", and you will find the file "01_STID" which lists all the stations. See the various documentation files, such as "ndp026d.pdf" for information on the data format (the first column in the station file is WMO station number). Regards, Dale Kaiser CDIAAC

Q Where can I find in your web site new statistics about the ranking of the the most world's countries whose emits more CO₂ ? Thank you! (5/26/08)

A Dear Caroline, We appreciate your question to the CDIAAC Web site. Rankings of the world's countries by their 2004 fossil fuel CO₂ releases may be found at http://cdiac.ornl.gov/trends/emis/tre_coun.html We are presently working on 2005 estimates and hope to have the web site updated this summer. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I would like to know what the 2004 total CO₂ emissions from fossil fuels were in France (not including Monaco) and Italy (not including San Marino). Thank you. (5/21/08)

A That is a question that we cannot answer, because the energy data from which we make the CO₂ estimates are combined. I think it is safe, however, to say that emissions from Monaco and San Marino are very small and neither France nor Italy would change significantly if these were subtracted. I would say that it is within the uncertainty limits of the numbers presented. I am sorry that we cannot do better. As a first guess you might assume that the per capita emissions are the same for France and Monaco and then reduce the France plus Monaco number by the fraction of the total, combined population that is in Monaco. Gregg Marland

Q I have downloaded the data for National CO₂ Emissions from Fossil Fuel Burning, Cement Manufacture, and Gas Flaring 1751-2004. According to information provided at the beginning of the document all emission estimates would be expressed in thousand metric tons of carbon, however the information on the heading of each column refers to CO₂ and not carbon. Could you please verify which is the unit used to express the data (carbon or CO₂)? Thanks (5/21/08)

A Dear Carla, Our emission estimates are reported in units of carbon, not CO₂. To convert to CO₂, multiply our estimates by 3.67. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[from Gregg Marland] It is always CO₂ emission expressed in terms of the contained carbon. Multiplying by the ratio of the molecular masses (44/12) will give the full mass of CO₂. Gregg

Q Are there recognized standards for the performance of carbon emissions calculation? (5/14/08)

A I would say that there are not really. The IPCC has published a 5-volume set of Guidelines for countries to use in estimating national emissions and the Kyoto Protocol process more or less requires that countries use these guidelines for preparing their national reports under the Framework Convention on Climate Change (UNFCCC). There are groups that have prepared guidelines for reporting at corporate or sub-national levels. For emission trading under the Kyoto Protocol, the UNFCCC has a body that approves methods for reporting emissions and emission transactions. I will send you a separate e-mail a recent short paper that we have prepared on the uncertainty of emission estimates and you may find this interesting. Gregg Marland

Q Do you have figures for carbon emissions per capita by country? this is for publication in the New York Times (5/9/08)

A Dear Hilary, Yes, we provide annual per capita estimates (expressed in tons carbon per person) in all our national tables. The national time series may be found at http://cdiac.ornl.gov/trends/emis/tre_coun.html There is also a file that lists the countries in descending order based on the 2004 per capita estimates. We are working on the 2005 estimates now. The file is located at <http://cdiac.ornl.gov/trends/emis/top2004.cap> Please feel free to contact me with questions. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q I am currently writing a research report for my M.Sc in environmental management looking at calculating the average carbon footprint of Malta. I came across a list of countries by carbon dioxide emissions per capita from 1990 through 2004 on Wikipedia as compiled by your organization where the average for Malta was given as 6.1 tonnes. I would like to know if you

A Dear Sarah, Thanks for your question to the Carbon Dioxide Information Analysis Center (CDIAC) web site. I am an Ohio University alum (1982). You are correct that our national fossil fuel CO₂ emission time series only extend through 2004. We are currently working on the 2005 estimates. As you might imagine, compiling energy production and use data for all the world's countries is a real challenge, especially for African nations. There are international efforts underway aimed at improving the timeliness of energy statistics reporting but for now a 2-3 year lag is the norm. I regret our 2005 estimates will probably not be available for your project but encourage you to check back in the coming months for the new estimates. They should prove interesting. Best wishes and regards to you and Athens, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Sincerely,

[Response by Gregg Marland] Sarah, the attached spreadsheet will get you to 2006. The 2004 values are simply a repeat of what you found on our web site, and this shows an additional 2 years. Let me know if there are any questions. By the end of June we will have the web site updated to include 2005 and we will have preliminary values for 2007. Gregg Marland

Q Does your company offer internships for those pursuing their education in the field of science? If so how may I come about applying for one? (5/9/08)

A Dear Marc, Yes, internship opportunities are available at Oak Ridge National Laboratory for students, researchers and professors at all levels. I suggest you visit the following ORNL web site to learn more about these opportunities <http://www.ornl.gov/ornlhome/education.html> Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q What is your policy on the use of numerical data obtained at this site? In particular, I would like to place the data in a spreadsheet for data analysis. Thanks, James Granger (5/4/08)

A Dear James, We appreciate your question to the CDIAC web site. The data on our web site are available for public use. We do ask that if you decide to publish any results from your analyses, please acknowledge the original source or adhere to any listed fair-use data policy (e.g., AmeriFlux data). If you are uncertain, simply send me an e-mail detailing what data you are using in a spreadsheet and I will reply with any restrictions, if any. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q Hello, We would like to quantify our reduction of coal consumption and our recycling activities on green gas effect. Could you quantify the following items: » Tonne of CO₂ emitted/ tonne of coal burnt. What is the average BTU/ton coal can we use (= ?14 000? Btu/ton) » 1 ton of CO₂ = A few examples of everyday life usage (ex: number of gas 5 gallons, number of cars running for a year, etc...). This is to illustrate to what our reduction corresponds » Do you have any data on green gas emissions for Mining and concentration steps of Copper and gold ores (Ex: ton of CO₂ emitted/tm of ore or ton of CO₂ emitted/ tm of pur copper) » If I have the energy consumption of mining activity including electricity, transportation, heating, etc... (ex: 70 Million of BTU/ton of ore) what would be a reasonable factor to use to convert this into equivalent tonnes of CO₂ emitted? I would really appreciate an answer by May 5th 4:00 pm. These informations are for a conference on recycling. Thank you and best regards, Simon-Pierre Morisset Senior Analyst Business Development (5/3/08)

A Coal is extremely variable but there is a good correlation between the energy content and the carbon content. You really need a good estimate of the energy content in order to estimate the CO₂ emissions. Knowing the energy input to mining needs to know further where the energy comes from. In Canada, for example, the electricity is probably largely hydro. I think that you are posing a significant research question. There is some literature on the CO₂ implications of recycled versus virgin metal for iron, and I think copper. When I get into the office on Monday I will see if I can recall the name of the scientist who has done this analysis. Gregg

Q Do you have the EPA emission factors associated with various types of generation? For example, coal emits about 1 ton of CO₂ per MWh, gas emits about 0.5 tons of CO₂ per MWh. What are the other factors? Thanks (5/1/08)

A Dear Dwayne, We appreciate your question to the CDIAC Web site. Your numbers are pretty good. U.S. coal currently averages around 968 kg CO₂/MWh. Natural gas is about 542 kg-CO₂/MWh. Distillate and residual oils are in between, around 750 kg-C/MWh. Because very little electrical power comes from oil, we don't factor it in until we know if it is distillate or residual oil. Nuclear (including solar), hydro, and wind are zero, once the facilities are built. NOW, the important caveat: These numbers are for power GENERATED. Because some of the electricity is used to power the generating station, and some is transferred to heat and electromagnetic energy in the transmission lines and transformers, you multiply by about the above by about 1.14 to get the amount of CO₂ per kWh DELIVERED TO YOUR COFFEE POT. TJ Blasing Sincerely,

Q I am currently writing a research report for my M.Sc in environmental management looking at calculating the average carbon footprint of Malta. I came across a list of countries by carbon dioxide emissions per capita from 1990 through 2004 on Wikipedia as compiled by your organization where the average for Malta was given as 6.1 tonnes. I would like to know if you

could kindly explain how this figure was reached, and what your sources of information were for Malta? It would be a great help for my research. Thank you very much for your help. (4/30/08)

A Ms Farrugia We received data from the United Nations Statistics Office that report energy use by all countries the UN also compiles data on population Most of this data is as reported by the countries themselves to the UN, although the UN does supplement it with data from other sources Data on the carbon content of the various fuels make a straightforward calculation of CO₂ emissions for each country. All of this data, and the computation methods are shown on our web site. Thanks for writing

Q I was wondering if there is any trend between carbon dioxide concentrations during the day time and the night time? any information on this would be greatly appreciated (4/29/08)

A Dear Michael Rabinowitz We appreciate your question to the CDIAC Web site. Actually there are notable differences depending on where you are. There are also differences between summer and winter. Probably the best introductory paper on this subject would be one by Diane Pataki, which I will send by separate e-mail since I can't attach anything to these responses. Sincerely, T.J. Blasing

Q I am interested if ORNL has updated state-by-state emissions data for years after 2001. I have tried to replicate the dataset at ORNL but am having problems doing so. If this data is available, I would be very grateful. http://cdiac.ornl.gov/trends/emission/stateemis/emis_state.htm Thanks Aaron (4/25/08)

A EPA and EIA have taken over that role, but budget cuts have limited their efforts. http://www.epa.gov/climatechange/emissions/download/CO2FFC_2005.pdf Is the EPA site; Andrea Denny denny.andrea@epa.gov is the very bright and gracious lady in charge of it. These data extend through 2005 TJ Blasing

Q how could i start trading of carbon (4/24/08)

A Dear Manish, I am not very familiar with carbon trading but I suggest you contact the International Emissions Trading Association (IETA) for your business interests or buy futures on the new NYSE Green Exchange or the Chicago Climate Futures Exchange. Thanks for your interest in the CDIAC web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hi, I am a PhD student. I found on the www.asl-associates.com website data about sulfur. It is written that CDIAC is the source of data. Can you tell me please how the data was collected? I mean the methodology you have used. Moreover I have another question about CO₂. Is the CO₂ calculated according to the emissions coming directly from power plants? Or the total value is collected according to the value taken from stations placed in different parts of the country? Thank you in advance. My Best Regards, Catia (4/23/08)

A Dear Catia, We appreciate your comment/feedback on the CDIAC web site. It is not clear what sulfur data you are referring to. Please respond with additional details and I will be happy to comment on the source and methodology. With respect to CO₂ emissions from power plants, our emission estimates are not based on actual emission readings from the stack or even fuel consumption at individual plants. Our emission estimates capture the emissions nationally by major fuel type and emission sector (e.g., fossil fuels consumed in electric generation at coal-fired plants). We use the same carbon coefficients and oxidation rates for the entire sector and major fuel type. I hope this helps. Please contact me if you have further questions. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q I read an article by William H. Calvin in the 'Atlantic Monthly' a while ago. The gist of the argument was that global warming might shut down the Atlantic current, that keeps Europe warm and paradoxically plunge us into another ice age. Is there any truth in this? (4/23/08)

A Dear Michael Bocchinfus, I haven't read the Atlantic Monthly article so I don't know exactly what it says. Most climatologists still seem to agree with IPCC on this subject so let me refer you to: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch10.pdf Section 10.3.4 for a pretty good overview of the current scientific consensus. Sincerely, TJ Blasing

Q I am studying/analyzing the changes in global temperatures and possible explanations thereof. Is there any possibility of obtaining values for global CO₂ emissions in 2005, 2006, and 2007 to extend CDIAC's compilation of such data over the period 1751 - 2004? (FYI I have been using a data series on fossil fuel consumption that is described and published at <http://tqe.quaker.org/2007/aux/GWStatsRev.html>. Regressions using that fossil fuel consumption data together with global population

and solar X-ray flux explain more than 85% of the variance in global temperature averages and indicate that fossil fuel consumption tend to have a VERY small downward effect on global temperatures) Thanks in advance for your efforts in responding (4/21/08)

A This spreadsheet repeats the 2004 numbers from the CDIAC web site plus it gives our preliminary estimates for 2005 and 2006. Estimates for 2007 should be available by the end of June. Thank you for your interest, Gregg Marland

Q Sorry if this seems a mere annoyance but I am involved in a spirited debate with climate skeptics who ask if CO₂ is an important factor in climate. Of course they claim it is not. I lead them to this site as an example of independent thinking on the subject. One fellow tried this avenue of questioning and was unsuccessful in getting through. Any thoughts to pass on? (4/20/08)

A Dear Russell, I apologize if you or any of your colleagues engaged in the climate discussion have experienced difficulties contacting us. You or your colleagues are welcome to call or e-mail me directly. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q Is there an ideal level of CO₂ in the atmosphere? (4/20/08)

A A very thoughtful question! I sometimes ask myself a very similar question with respect to climate change "Is change automatically assumed to be bad?" I think my answer is that the Earth is occupied by some 6.5 billion people. These people, their cultures, their infrastructure, their agriculture, their natural surroundings, were all achieved under the current climate. Any change in climate is likely to produce some stress on all of these systems, at least over the short term. Then we get into your priorities and values. I think it is a good question and a good starting point for discussion. Cheers, Gregg

Q 2 questions: What is the % of the flue gas of an efficiently fired boiler? What is the % of CO₂ percentage in the flue gas of an efficiently fired boiler? (4/20/08)

A Dear Nancy Rust, We appreciate your question to the CDIAC Web site. I sent some material by separate e-mail. Hope it helps. Sincerely, TJ

Q I am trying to conduct research on how much carbon dioxide gas is produced by materials i.e., steel, plastics, foam, etc. Any/all assistance you can help me with in gathering this level of detail, would be most helpful. Thank you in advance, Lisa (4/17/08)

A Dear Lisa Mandrell, We appreciate your question to the CDIAC Web site. Try this web site. It is pretty ramified, but it probably contains at least some of what you want. Please let me know if I am close to the target in terms of assessing your needs. <http://www.epa.gov/climatechange/emissions/usinventoryreport.html> Sincerely, TJ Blasing

Q I understand you are looking for help in extracting daily temperature readings from a national weather service database to an Excel spreadsheet. I would love to help you with this. I'm based in California, highly interested in environmental matters, and have been working as a programmer with databases and MS Access/Excel for over 12 years. Please let me know if I can help on a telecommute basis. I can send you my resume and more info. Thank You Roberto Giannicola Walnut Creek, CA 925 286 6958 giannicola@sbcglobal.net (4/16/08)

A Dear Roberto, Thanks for your offer to assist. We do not have a need right now for the type of extraction you described but you might wish to forward your resume for future reference. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335

Q Do you have any data regarding how long the United States remained as the chief emitter before China took over? (4/16/08)

A Dear Orlando, We appreciate your question to the CDIAC Web site. Please refer to the following URL for fossil fuel CO₂ emission time series for China and the United States: http://cdiac.ornl.gov/trends/emis/tre_coun.html Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

[From Gregg Marland] Interesting question, actually. You might look through the charts on our web pages to check up on me, but industrialization based on fossil fuels started in Western Europe and several countries had early emissions levels higher than in the US (France, Germany, the United Kingdom). My quick look is that the US became the largest emitter, taking over from the UK somewhere in the 1988 to 1990 interval. The data from this period are not as good as the recent data, but I would say that the US has been the largest emitter continually since 1890. Gregg Marland

[more from Gregg] I suspect that by now you have figured out that I should have typed 1888 and 1890. Thanks for noticing TJ.

Gregg

Q Why is water vapor omitted from the list of greenhouse gases when it is so much more prevalent in the atmosphere than CO₂ and other gases? What would the GWP of water vapor be? (4/16/08)

A Dear Russell, We appreciate your comment to the CDIAC web site. No question water vapor is an important greenhouse gas. I agree that water vapor should be listed more prominently on our web site. We do have continuous measurements of water vapor fluxes into and out of different vegetation types. We do not include water vapor in our summary tables for atmospheric levels of greenhouse gases because of the difficulties in quantifying the abundance of water vapor in the atmosphere (i.e., variability in the atmosphere over space & time, short lifetime, complex chemistry and the difficulties of measuring some of these related species - hydroxy radical). Thanks again for your comment. This is something we clearly need to address. Regards, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Why do you not include Water Vapor as a greenhouse gas? http://www.geocraft.com/WVFossil/greenhouse_data.html (4/14/08)

A Dear Robert, We appreciate your comment to the CDIAC web site. No question water vapor is a greenhouse gas. I agree that water vapor should be listed more prominently on our web site. We do have continuous measurements of water vapor fluxes into and out of different vegetation types. We do not include water vapor in our summary tables for greenhouse gases for obvious reasons (variability in the atmosphere over space & time, short lifetime, complex chemistry and the difficulties of measuring some of these related species - hydroxy radical). Thanks again for your comment. This is something we clearly need to address. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335

Q I was wondering if there is any data dealing with the emissions of Carbon Dioxide for horses (4/13/08)

A Dear Michael Rabinowitz, We appreciate your question to the CDIAC Web site. Try: Altman PL, Gibson JF, Wang CC (1958) Handbook of Respiration Prepared for The National Academy of Sciences, Division of Biology and Agriculture W.B. Saunders Company, Philadelphia, Pennsylvania pp. 43-44. You may need to find a librarian first, this is an old publication and may not be readily available. Sincerely, TJ Blasing

Q To Whom It May Concern, I am writing to you to ask for your help to find some background analysis regarding your data on the CO₂ emission estimates on Japan for NHK's television program "Japan From Now On." NHK, the Japan Broadcasting Corporation, is the only non-profit public television in Japan. We broadcast television & radio programs nationwide. "Japan From Now On" is a 3-hour special debate program which is broadcast once in every 2 months. We are planning to broadcast the next one on June 7th about Japan's CO₂ emission. Your data on Japan's CO₂ emission shows that there wasn't big increase in CO₂ emission between 1973 and 1987. However, it has been increasing dramatically after 1988. What do you think of the cause in this trend? What made CO₂ emission in Japan to increase since late 80s? We would really appreciate it if you could help us with this matter. Thank you very much for paying attention to this matter. I look forward to hearing from you.

***** Midori Matsumoto, Ms. Program Director "Japan From Now On (Nippon no korekara)" JAPAN BROADCASTING CORP. 2-2-1 Jinnan, Shibuya-ku, Tokyo 150-8001, JAPAN e-mail: s02711-doremido@nhk.or.jp TEL: +81-3-5455-2175 FAX: +81-3-3469-1799 *****

(4/8/08)

A Dear Midori Matsumoto, Thank you for your question to the CDIAC Web site regarding Japanese fossil fuel CO₂ emissions. The data are provided at http://cdiac.ornl.gov/trends/emis/tre_jap.html. The two main reasons for increasing CO₂ emissions in Japan over the past two decades are increased use of natural gas and coal. Japan is the world's largest importer of coal and third largest importer of natural gas. Japan is also heavily reliant on crude oil but crude oil consumption patterns in Japan have not changed markedly over time. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory Oak Ridge, Tennessee 37831-6335 USA

Q I'm sure carbon sequestration is not a simple matter, but I wonder if we have considered sequestering CO₂ in old oil wells? It might reactivate some of them and allow additional oil to be extracted. I prefer renewable resources of energy, but reducing our demand for imported oil may have some beneficial temporary value. Has this been considered and if so by whom and where? (4/1/08)

A Mr Gorman, This idea has indeed been considered. In fact we first proposed it in a report published by Oak Ridge National Laboratory in the early 1980s. But the best place to get an up-to-date look at the range of ideas is a Special Report on Carbon Capture and Storage published recently by the IPCC (Intergovernmental Panel on Climate Change). Look at www.IPCC.ch, and then click on "IPCC Reports", and "Special Reports". If you have trouble finding it, let me know. Our best, Gregg Marland

Q Dear Sirs, Comparing your fossil fuel CO₂ emissions data with CO₂ emissions data provided by the World Bank WDI, I see the huge (up to 4-times) difference between those. At the same time comparing the UN CO₂ per capita emissions database

(originating from CDIAC data) and the mentioned WDII see almost identical numbers. My conclusion is you guys have broader 'total' CO₂ emissions series data different from "narrow" fossil fuel ones. Where can I find those? I am a PhD student in Economics doing my research project. Thank you for your time. Sincerely, Olexandr Vasetsky (3/29/08)

A I think that you will find that our numbers are expressed as metric tons of carbon whereas those from the world bank are as metric tons of carbon dioxide. You can convert by multiplying by the ratio of the molecular masses $44/12 = 3.67$. That is, you should multiply our numbers by 3.67 to get tons of carbon dioxide. Either is entirely correct; it is just a matter of how you want to express things. Cheers, Gregg

Q Does the CDIAC have a recent (within last 2 years) statistic for Global Emissions of Carbon Dioxide From Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring? I have referenced this table (<http://ceq.eh.doe.gov/NEPA/reports/statistics/tab11x2.html>) for figures from past years, but need data for the last year or closest available year. Thank you for your time. (3/28/08)

A Here are our preliminary estimates for 2005 and 2006. We should have the formal update for 2005 before long. Gregg

Q Your data on Carbon Dioxide Emissions here (<http://cdiac.ornl.gov/trends/emis/top2004.tot>) seems to tally with the data from UNFCCC (CO₂_mdg_total), except Norway, which seems very different. Do you know why this would be? Thanks (3/27/08)

A John, you are an astute observer. We have problems with the Norway data; we are aware of this, we are working to figure out the problem. Basically, our CO₂ emissions estimates rely on the United Nations energy statistics, and there is a problem there with the Norwegian energy statistics. We have made contact with the energy statistics office in Norway and are hopeful that we will have a resolution soon. I might hasten to add that this is the only country in our data set where we are aware of such a problem. My apologies if this has created a problem for you. I should also thank you for writing. First, because this is one way that we can discover data problems, and second because you are not the first to note this problem in Norway and every letter encourages us to resolve the problem as quickly as possible. Cheers, Gregg Marland

Q Is there any way to get more recent monitoring results for atmospheric CO₂ at the Mauna Loa monitoring station? You currently provide data through 2004, an update through at least 2006 would be helpful. Thanks, Jeff (3/27/08)

A Dear Jeff Short, we appreciate your question to the CDIAC Web site. I have replied by separate e-mail so I could attach a record. Unfortunately, the venerable record you requested is not being maintained and, ironically in your case, is being replaced with the NOAA record I sent. Sincerely, TJ Blasing

Q The monthly precipitation data at station 452675 downloaded from http://cdiac.ornl.gov/epubs/ndp/ushcn/state_WA_mon.html are different from the http://cdiac.ornl.gov/ftp/ushcn_monthly/hcn_doe_pcp_data.Z. So what are the correct values the user should use? Thanks (3/27/08)

A Yes, in most cases I would think so. Where the two do differ you will just need to decide how much you trust either one. For temperature, trusting the network usually makes good sense, but for the much more discrete precipitation variable, I dunno. Especially since HCN stations in most cases are not very close together. Dale

Q Do you have any tables of data for CO₂ emissions that could be used to create a linear graph? (3/27/08)

A Dear Dawna, we appreciate your question to the CDIAC Web site. You should find a pretty good menu of available data series at: http://cdiac.ornl.gov/trends/emis/em_cont.htm. Sincerely, T.J. Blasing

[From Gregg Marland] http://cdiac.ornl.gov/trends/emis/meth_reg.htm. Dawna, I am not sure that I understand your question. I assume that you have been to the portion of our web site listed above but did not find exactly what you were looking for. Maybe you could look again at those web pages and then let me know exactly how we might be helpful. Cheers, Gregg

Q how much CO₂ does 1 gallon of LPG emit? (3/26/08)

A LPG is typically traded by mass, not volume. To know the carbon content per unit volume you would have to know the temperature and pressure. Even then the CO₂ emissions rate is most easily dealt with if you have the quantity of LPG measured in joules or BTUs. Gregg Marland

Q Hello, I have used the UN site <http://mdgs.un.org/unsd/mdg/Data.aspx> to compare CO₂ emissions data for a couple of countries and when I looked at Norway, something mysterious seemed to happen. According to your CDIAC data series, Norway's per capita CO₂ emissions* almost doubled between 2000 and 2003*! This appears to be rather implausible. The UNFCCC

data series does not show any increase at all since 1996 for Norway, and for the other countries that I checked, the two data series correspond well. So I am curious whether you have an explanation for this surprising discrepancy. Thanks (3/25/08)

A Toni, We are aware that there is a problem with our data series on Norway and are working right now to resolve the problem. The problem is in the basic energy data that we use to estimate CO₂ emissions. You have succeeded in finding the only country for which we currently have known, unresolved problems. We apologize if this has created problems for you. Gregg Marland

Q I tried to ask this question on your website, but when I selected "submit" it told me that the email address I entered was invalid. The address I entered is my email address. It was entered correctly. My question is a repeat of that I asked on 28th Feb, for which I have not received an answer or even an acknowledgment viz: Please cite peer reviewed reports from reputable publications of experiments showing that increased carbon dioxide in the atmosphere will lead to global warming (3/24/08)

A Dear David, My apologies for the difficulties with your previous submission to our web site. We appreciate your comment and it is one dear to our heart and work practices. I certainly try to exert great care in providing references to the published peer-reviewed literature and to exert caution in explaining the warming trends measured over the past several decades. Is there a specific presentation on our web site that prompted your comment or are you just generally skeptical about the greenhouse gas induced climate debate? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hi can you please take a few minutes to watch these two videos of phase one of a four phase solution to air pollution and global warming we are not looking for a grant we would really appreciate any other help you can give us. for instance political, news media, etc... http://www.youtube.com/watch?v=G42Dzw_rx8k and http://www.youtube.com/watch?v=D6_owddGTiM Thank You in advance Envio Clean (3/21/08)

A Dear Dominick Rossi, Good luck with your filter patent. Sincerely, Tom Boden

Q We can't find your dataset of monthly CO₂ data for Moana Loa Hawaii, for 1957 - on. Please direct us, or send us that file. (3/19/08)

A Hi Roy, Always a pleasure to interact with you. The Keeling Mauna Loa CO₂ record at CDIAC is located at <http://cdiacornl.gov/trends/CO2/sio-mlo.html>. Sadly, the record is now dated. We have not received a single update since Dave's, and Tim Whorf's, deaths in 2005. I spoke with Steve Piper about this last week and it appears updates may be available soon. All the best, Tom Boden

Q How is carbon dioxide in the oceans and in the atmosphere related? (3/18/08)

A There are college courses on this subject. Very briefly, from the atmospheric perspective, all other factors being constant, the greater the partial pressure of CO₂ (another way saying the atmospheric CO₂ concentration) the greater the transfer of CO₂ from atmosphere to ocean. However, all other factors are never constant. The amount of CO₂ in the oceans also influences how much CO₂ is transferred from ocean to atmosphere as nature tries to achieve an equilibrium. Of course, there are other complications. Warm beer is flat and so is a warm ocean. That is, the warmer the ocean, the less CO₂ it can contain (just like beer). There are also interactive mechanisms that influence the "biological pump" which is another name for the way plants take up carbon, and some of that carbon is transferred to the deep ocean or ocean bottom as marine organisms die. That is the most concise answer I can give right now. There is a more detailed discussion at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf starting around page 528. TJ Blasing

Q What do you think the chemical and physical implications of both atmospheric carbon dioxide increases and global warming will have on the oceans? thanks (3/18/08)

A Probably the most authoritative source of information in plain English on that subject is found at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch07.pdf beginning around page 528. TJ Blasing

Q I am undertaking a study on carbon sequestration in tropical forest. My question is have you undertaken a similar study using remote sensing and G.I.S.? could you please assist me with more material on this area of study (3/14/08)

A I think that you are taking on an important project. I am sorry to report that we do not have any studies that might be helpful for you. Gregg Marland

Q Your figure for CO₂ per capita emissions for Gabon in 1993 reads as 10.27 on both your ACSII file and your CSV file http://cdiacornl.gov/ftp/ndp030/nation1751_2004.ems http://cdiacornl.gov/ftp/ndp030/CSV-FILES/nation1751_2004.csv a ten-fold jump from the previous and the following year. Furthermore total CO₂ emissions does not even increase two-fold between

1992 and 1993. Therefore I strongly believe that there is a mistake in the figure for Gabon 1993 that you are reporting. Please let me know if there is an explanation for it, or whether I am right and there is a mistake (3/14/08)

A Dear Maximé Thank you for pointing out the error in the Gabon per capita time series. The problem was in the population time series and a zero was left off the 1993 value (i.e., 1992 = 990,000 people; 1993 = 102,000; and 1994 = 1,040,000). I have revised the 1993 per capita estimate (1.03) based on 1.02 million people. Thanks again for taking the time to point this out to us. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear Madam or Sir, for our program "Plant for the Planet" (<http://www.plant-for-the-planet.de>) we are seeking for some information. Maybe you have this information available. We would like to know how much CO₂ is produced by a book? How much CO₂ is released into the air for the production of a book? As a basis of a calculation CO₂ per Kilogram seems suitable. For your background we would like to offer books on our homepage. We would like to arrange it CO₂ neutral. Therefore with the a.m. information we can notice how many new trees have to be planted to reduce the CO₂ emission of the produced book. We would like to thank you in advance and wish you a pleasant week. Global Marshall Plan Initiative / Plant for the Planet Sebastian Kraußlach (3/13/08)

A Dear Sebastian Kraußlach The "internal" CO₂ produced depends on the processes used, how much energy those processes consume, how much of that energy is fossil energy, and whether that fossil energy is supplied by combustion of solid liquid or gaseous fuel. The "external" CO₂ involves construction and haulage of the equipment and materials used to make a book. For this, you would need an estimate of how much energy is needed to cut trees, make pulp, turn pulp into paper, package the paper, and haul it to your facility. The same is true for your equipment. How much energy is used to mine the ore, process the ore (including coking of any steel) manufacture your printing equipment or other machinery, and haul it to your site. I don't think you would want to get into "2nd-order external" CO₂; for example, how much energy was used to make the truck to haul the material to your site, etc. I would do the "internal" CO₂ first. I use my utility bills as a guide to how much energy I consume. I heat with natural gas (13.7 grams of carbon/Megajoule or 13.7 g-C/Mj), electricity delivered to my house is about 180 g-C/kW-h, (including "waste heat" produced at the power plant) and coal combustion is around 25 g of carbon per megajoule. Multiply all these by 3.66 to convert carbon to carbon dioxide. Your employees need to use gasoline to get to work, and material needs to be hauled to your site. 625 g/liter is about right for carbon only. 625 X 3.66 is about 2.3 kg per liter for CO₂. I think I've covered the basics. Of course, I am assuming the trees you plant are not on land you own to grow trees to provide paper to make your books. We appreciate your comment/feedback on the CDIAC Web site. Sincerely, TJ Blasing

Q hi, i am a french business school student doing a statistical report on global warming and the link between variations in temperature and average carbon dioxide levels in the atmosphere. I would like to know where I may find a data sheet of some sort giving me the annual level of carbon dioxide in the atmosphere from around the middle of the nineteenth century to now. thank you for your help Alexander Bullett (3/11/08)

A Dear alexander bullett I use 280 ppmv as a preindustrial CO₂ value. You may wish to look at IPCC WGI report, page 135, where there is a graph for reference http://ipcc-wg1.ucar.edu/wg1/Report/AR4WGI_Print_Ch02.pdf We appreciate your comment/feedback on the CDIAC Web site. Sincerely, TJ Blasing

Q For school I need to collect carbon dioxide samples from soil to find out their concentration. What is the best method to measure the amount of CO₂ in the soil because I am in a high school class room. (3/10/08)

A Dear Michael Rabinowitz See if any of these sites help <http://www.rothamsted.ac.uk/aen/smbweb1/methods.php?id=895> <http://www.jstor.org/view/00129658/di960210/96p0252d/0> http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=170959 Sincerely, TJ Blasing

Q Thanks a million for your follow up of my request concerning data availability till 2007 for land use changes and fossil fuel combustion. I have gratefully received data per region - Are these data available per country, I am working on the 20 Mediterranean countries. Thanks again, Mariam (3/1/08)

A Dear Mariam, I trust you have seen our national fossil fuel CO₂ emission time series at http://cdiac.ornl.gov/trends/emis/tre_coun.html including for the countries in the Mediterranean region. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q [1] Do you have anywhere on your site up-to-date (e.g. 2007) data on the carbon dioxide concentration in the atmosphere? Preferably Mauna Loa. [2] When do you expect to publish the global carbon release data for 2005? (2/29/08)

A Dear Michael, We appreciate your questions directed to the CDIAC web site. For the latest Mauna Loa atmospheric CO₂ data ftp://ftp.cmdl.noaa.gov/ccg/CO2/trends/CO2_mm_mlo.txt We now have the 2005 United Nations energy statistics in hand and are processing the data to produce the 2005 fossil fuel emission estimates. Barring unforeseen problems with data we should have the updated global estimates available on our web site during March. Sincerely, Tom Boden Carbon Dioxide

Q I am so confused I see different numbers all over the board for total global emissions of CO₂ (not CO₂ e). Can you help by telling me the total in gigatonnes? When I add up the tables on global emissions for 2004, I get 4,910 million tonnes? I keep seeing numbers elsewhere like 7 gigatonnes (George Monbiot) to 40 gigatonnes. Which one is correct? (2/28/08)

A Dear Guy, Our global fossil fuel CO₂ emission estimates are provided at http://cdiac.ornl.gov/trends/emis/tre_glob.htm. Our 2004 estimate is 7.9 gigatonnes of carbon. Many sites report in CO₂ units which would make our 2004 estimate ~29 gigatonnes of CO₂. We appreciate your comment/feedback on the CDIAC Web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Do you have data on the change in greenhouse effect of CO₃ with changes in atmospheric concentration? As per Beer's Law it should not be linear. (2/26/08)

A Dear Jack Carney, You are correct. The material in Section 10.2 (and especially Table 10:2) in Chapter 10 of the IPCC Working Group I report would give you a first approximation and some leads to follow (e.g. Gerald Meehl) if you wish to inquire further about what they wrote for CO₂ (not CO₃). http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch10.pdf. Sincerely, TJ Blasing

Q Hello, I am an academic researcher in Turkey. I am at the physics department and I make research about gas sensors. Can you help me about that subject? I search a company which can obtain a sensor sample. Thanks in advance. Dr. SONGÜLÜF; ATGAZ; OSMANPA; A UN; UNIVERSITY TURKEY (2/25/08)

A Dear Songül, Thank you for your question to the Carbon Dioxide Information Analysis Center. I suggest you visit our AmeriFlux web site at <http://public.ornl.gov/ameriflux/resource/equip-tips.shtml> for detailed information about measurement sensors and instruments. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I have been using your national data for fossil fuel CO₂ emissions for a large range of countries and was wondering if this data was in terms of consumption or production? The literature I have read implies that it is consumption but I wanted to check whether this is the case. Many thanks for your help. (2/20/08)

A Dear Gemma, We appreciate your question to the CDIAC Web site. Our global fossil fuel CO₂ emission estimates are based on energy production data for individual countries provided by the United Nations. Our regional and national estimates are based on production and trade (i.e., exports, imports, stock changes, bunker fuels) data provided by the UN for individual countries. Coupling the national gross production and trade data yields an estimate of the national "net apparent consumption". Detailed consumption data are too spotty in the UN database to produce reliable regional and national emission estimates. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I would like to know the top 20 companies in the United States with the greatest emissions. (2/19/08)

A Dear Amanda, We appreciate your comment/feedback on the CDIAC Web site. I regret we do not have a ranking of US companies in terms of emissions. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q South Africa is currently experiencing major power outages due to high demand and a growing economy. The government has indicated that they intend spending R26b over 2 yrs to purchase 300m tons of coal and R1 trillion by 2025. What impact is this going to have on CO₂ emissions? (2/15/08)

A Dear Neil, Roughly speaking, for each ton of coal burned 0.746 tonnes of C is released. If South Africa is going to rely on increased coal usage to meet SA's growing energy demands, expect SA's fossil fuel CO₂ emissions to rise as well, even if energy efficiency measures and clean coal technologies are implemented. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am doing a project for my school and was asked to find the information below about the island of Samoa. I was hoping you could help me or point me in the right direction. Kindest regards, Clare Grange 12. the total carbon dioxide emissions (in

tonnes or part thereof) per annum of your island 13. the carbon dioxide emissions (in tonnes or part thereof) per person per year .
14. the current breakdown of energy sources used in your island state (2/12/08)

A Dear Clare, I seem to have exceeded the time limit our system allows for writing my response Here is part 2 The United States emits around 20 Mg-CO₂ per person. Sincerely, T.J. Blasing

Q Hello I am doing an extended essay on carbon dioxide concentrations dealing with a farm setting I was wondering if you have any data dealing with farms, and if so if they are around the Washington DC area. Also do you have an data for a valley versus a mountaintop? Also if you have any other advice for me I would greatly appreciate it. Thanks (2/11/08)

A Dear Michael Rabinowitz There are many sources of CO₂ from farms. There is CO₂ exchange between soils, plants and the atmosphere Also, from livestock and from energy used to operate the farm. If you can be a little more specific I will be happy to try and point you in the right direction for the information you are requesting Sincerely, Tris West

Q I am using data from the USHCN. I notice that one of the sites I am interested in only has RAW precipitation data available (no FILNET or anything else). What does this mean exactly? Was this just filtered for outliers and nothing else? Were the TOBS corrections done? And corrections for location or instrument change? (2/8/08)

A Tim, If a station only has "raw" data, then the following is the case "Areal Edited (Raw) A quality control procedure is performed that uses trimmed means and standard deviations in comparison with surrounding stations to identify suspects (> 3.5 standard deviations away from the mean) and outliers (> 5.0 standard deviation)." No TOBS or any further QA procedures applied. Areal edited/raw data are the first type of data within the 6 types... "These steps are applied so as to sequentially produce six different types of data records with each successive record type using the preceding record type as input." This info. is taken from the documentation at: <http://cdiacornl.gov/epubs/ndp/ushcn/ndp019.html#descrip> Hope this helps Dale Kaiser CDIAc

Q To whom it may concern, I have an extremely simple way to cut down on emissions from vehicles The best part is we already have in place what's needed to do it therefore it really doesn't cost a dime. Here's my suggestion each city town whatever take a look at the amount of traffic at their traffic lights between the times of 9pm and 5am and then instead of the timed lights they now have which leave most vehicles polluting the air standing alone at the intersection with no other car in sight and changing those lights so the direction most traveled becomes a constantly blinking yellow (proceed with caution) and a blinking red on the other street (stop look and proceed with caution) Doesn't it make sense? (2/7/08)

A Dear Donald We appreciate your comment to the CDIAc web site. I agree your idea makes good sense and would certainly help with traffic flow, exhaust emissions and fuel efficiency. Improved fuel efficiency will reduce car emissions but so long as our cars continue to run on fossil fuels, whether during peak hours or off hours, they will still contribute to increased atmospheric levels of carbon dioxide. Thanks and please keep looking for good, practical solutions Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Please update your very important current data page of http://cdiacornl.gov/pns/current_ghg.html June 2006 is not sufficient (2/3/08)

A Dear Richard We appreciate your comment to the CDIAc Web site. You are positively correct We are working to update the page now. Thanks for alerting us to this dated page. Sheepishly Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q The star gas.xls data base contains info on sampling latitude, but not sampling longitude Can you tell me where the various samples were taken? Other data bases give start and finish for sampling latitudes and sampling longitudes (1/30/08)

A Dear John Wiley, We appreciate your question to the CDIAc Web site. You may wish to contact Leifer@eml.doe.gov. with your question Sincerely, T.J. Blasing

Q If you had a hydrogen (only) burning vehicle and while running that vehicle would draw into the engine, pollutants and CO₂. The pollutants would be burned in the combustion cycle, what happens to the CO₂? Thanks! (1/28/08)

A Dear Mark Hefron, CO₂ is quite stable, so the answer is likely to be "nothing" An automotive engineer at your nearest university would have a better idea of what would happen to a CO₂ molecule drawn into the combustion process We appreciate your comment/feedback on the CDIAc Web site. Sincerely,

Q Where is the data of current atmospheric CO₂ levels? Thank (1/15/08)

A The Mauna Loa average for 2007, according to NOAA, was 383.7 ppmv. This agrees with some other preliminary indicators that the global average for 2007 was in the 383-384 range. TJ Blasing

Q What is the average earth temperature for the 1961-1990 period? (1/13/08)

A Dear Joe, The average mean surface air temperature for the Earth from 1961-90 was 15 degrees C (59F). Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Does CDIAC have a reference page for the amount of CO₂ equivalent from a tonne of thermal coal and the same calorific value for oil and gas and their subsequent CO₂. (1/8/08)

A We multiply the amount of fuel (in whatever units) by the thermal conversion factor given in Appendix A of Monthly Energy Review. <http://www.eia.doe.gov/mer/> Then we multiply the result by the carbon coefficients given in Tables A 28 and A 29 of the Inventory of Greenhouse Gas Emissions and Sinks (Annex 2) <http://www.epa.gov/climatechange/emissions/usinventoryreport.html> We then multiply by a combustion efficiency, these are also given in Annex 2 of the inventory document (2nd reference above). CAUTION (1) These are values for the USA; Gregg Marland, to whom a copy of your question was also sent, may have better values for Australia (2) For petroleum especially much of the carbon is not combusted but is stored in plastic products used as solvents or lubricants etc, so if you are doing a carbon emissions inventory I would strongly suggest you become familiar with the inventory document I referenced above, so as to get a feel for how the accounting goes. TJ Blasing

Q first of all would like to wish you Merry Christmas and Happy new year. My questions related to data provided on <http://cait.wri.org/> It's till 2003 for land use changes and fossil fuel combustion are data from 2004 to 2007 available anywhere? BR, (12/30/07)

A Dear Mariam, We appreciate your comment/feedback on the CDIAC Web site. I am forwarding to you separately a file containing the global, annual CO₂ releases from land-use for 1850-2005 courtesy of Skee Houghton at Woods Hole Research Center. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hi! I am a high school student doing an analysis project on CO₂ emissions. Can you provide me with some data, for the U.S.A, UK, and China? I need the total CO₂ emissions per year from 1990 - 2004. Thanks, Kevin (12/23/07)

A Try this and get back to me if you have any questions http://cdiac.ornl.gov/trends/emis/em_cont.htm TJ Blasing (865) 574-7368

Q When a tree decomposes it releases a fixed amount of energy (BTU). It doesn't matter if it is fast (fire) or slow (natural decomp), you get the same amount of energy released. The Question: Does the same tree release a fixed amount of carbon when it decomposes regardless of speed? (12/23/07)

A The generic answer to your question is: "Yes" You may wish to get more detail in a biology text or Chapter 7 of the "IPCC report" <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>

Q Hi, I would like to compare mathematically CO₂ and Temperature ice core data with a spreadsheet program I have developed. I am looking for the data in a text format. How can I get that? Thanks, Steve Hemphill (12/22/07)

A Jean-Marc Barnola barnola@glaciog.uif-grenoble.fr would be the person to contact about your project and the data you need. What you will find is that: (1) dating inaccuracies cloud the data during the ups and downs and it's not particularly certain which time series is leading at any one time, and there is no reason to assume either one should be. There is a feed-forward interaction as long as the temperature is changing (2) during peak/trough periods, the temperature will probably tend to lead the CO₂ because the first cause here is changes in the seasonal and latitudinal amounts of solar radiation reaching the earth. (3) a warm ocean is a flat ocean, just like warm beer is flat. As the ocean cools it can hold more CO₂. (4) Beyond that, anything you find might actually be news to someone and therefore worth publishing. The effect I described in (3) above can't explain everything about ocean CO₂ changes. There are also ocean stratification mechanisms and nontrivial changes in the amount of sea ice interfering with atmospheric CO₂ transport. If you need more information on this subject, contact Jeff Severinghouse at Scripps Institution of Oceanography. He could guide you to the literature on this subject more quickly and accurately than I can.

Q Hi, I am putting together a presentation in which I want to rank Australia against other developed nations in terms of per capita CO₂ emissions. What is the most recent data I can use? (12/18/07)

A Dear James, We appreciate your comment/feedback on the CDIAC Web site. The latest per capita fossil fuel CO₂ emission estimate we have for Australia, 4.41 metric tonnes carbon, is for 2004. These data may be found at <http://cdiac.ornl.gov/ftp/>

Q I am a student at University of Bergen (Norway) and study economics. I write a paper on how to estimate CO₂ - emission over time and I use your data on national CO₂ - emission. But there is something I don't understand. When I take total CO₂ - emission divided on population (data from Penn data) and compare this with your data on per capita CO₂ emission, I don't get the same results as you. Do you know why? There is only one observation that gives the same value. (I use STATA) (12/17/07)

A Dear Elisabeth, Thank you for your question to the CDIAC Web site. I apologize for the delay in responding. It was not clear from your question whether you were talking about the global or Norwegian per capita estimate. Regardless, both our emission estimates and the per capita estimates are based on energy statistics and population estimates provided by the United Nations. For example, our 2004 global fossil fuel CO₂ emission estimate is 7.910 billion metric tonnes of C and the 2004 global population estimate is 6.4368 billion people. $7.910/6.4368 = 1.23$ metric tonnes C/person. This is the same global per capita estimate provided in http://cdiac.ornl.gov/ftp/ndp030/global.1751_2004.ems. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I found a list of sovereign states by man-made carbon dioxide emissions on Wikipedia. It says that "Data were collected in 2004 by the CDIAC for United Nations". Do you have any more recent data than 2004? If so, I would appreciate a link or some other means to find the most recent information. I would like this information as soon as possible in order to include it in a potential internet educational global warming video for the new year. Also, I would like to thank you for all that you have been doing to provide information about this enormous issue. It has the potential to service Earth and educate the public. (12/13/07)

A Dear NF, We appreciate your comment/feedback on the CDIAC Web site. We expect to have updates through 2005 for our fossil fuel CO₂ emission estimates in March 2008. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q What is the half-life of CO₂ in the upper atmosphere and what are the products of its degradation by cosmic rays, etc.? Thank you for your help. (12/12/07)

A Dear C. W. Dingman, MD, This lady could provide an answer to your question as anyone could. Barbara J. Finlayson, Pitts Professor, Chemistry Univ. of CA, Irvine. Email: bjfinlay@uci.edu Phone (949) 824-7670 Fax (949) 824-3168 Sincerely, TJ Blasing

Q I want to calculate the "Greenhouse gas emission" for Pakistan. Can you please send me the method/formula to calculate the emissions. (12/5/07)

A Dear M. Tayyab, We appreciate your question posted to the CDIAC Web site. Please visit the two web sites listed below for the greenhouse gas methodologies and calculation typically used in the United States, which are compliant with the Kyoto Protocol, and for fossil fuel CO₂ emission estimates for Pakistan. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodent@ornl.gov <http://www.epa.gov/climatechange/emissions/index.html> <http://cdiac.ornl.gov/trends/emis/pak.htm>

Q How is it that they can determine how much carbon dioxide was in the air in the past through the testing of ice samples? (12/5/07)

A Dear Megan, We appreciate your question to the CDIAC Web site. In frigid climates like Antarctica where it never gets above freezing for extended periods of time, ice continues to accumulate until eventually it becomes sealed off from the atmosphere. Air bubbles get trapped in the ice as it forms, thus preserving an air sample from whatever period when the ice was formed and eventually sealed off from the air above. Researchers have techniques to date the ice, much like carbon dating fossils, and techniques to extract the air bubbles without contamination. The air sample is then analyzed using an infrared gas analyzer to determine the CO₂ concentration in the air bubble. Pretty cool, huh? Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q We are finishing our first year of data collection for the AGFACE (Australian Grains FACE) project in Horsham, Australia. How can we have our site listed on your website as part of the global list of FACE projects? Thank you, Glenn Fitzgerald, Project Leader for Department of Primary Industries, AGFACE (12/4/07)

A Hello Glenn, I would be happy to add your site information to the FACE Data Management System website (<http://public.ornl.gov/face/>). I am currently in the process of updating the 'Face Site Locations and Contacts' information. To be included, please send me the following information: Site name, lat/lon coordinates, ecosystem, contact name and email, URL for project website (if applicable), CO₂ treatment level, plot diameter, sponsor. Are you interested in archiving and distributing your data?

throughour site? Thankyou for your interest Sincerely, Lisa Olsen CDIAC

Q how much CO₂ is releasedwhen I burn LP or natural gas in my 95% efficientfurnaceand the outputis 1 millionbtu's? How much CO₂ is releasedwhen I burn wood or corn in my 90% efficientfunaceand the outputis 1 millionbtu's? how much CO₂ is releasedwhen I use electric heat producedby a coal fired electric plantto get 1 millionbtu's? (12/2/07)

A Dear bruce jagodzinski; For natural gas it's 14.47 kg-C/MMBtu. A nontrivialfraction of this heat will go to the atmosphere through the exhaustvent. The fraction will depend on the overall efficiency of your furnace, for which a 95% figure is probably dreaming. Coal used in the USA to generateelectricity gives, on average, 25.76 kg-C/MMBtu. Usually, at this point, we convert to kWh (3412 Btu = 1 kWh), but I'll stay with Btu for now. About $25.76 \times 3 = 77.3$ kg-C/MMBtu of electrical energy GENERATED (2/3 of the heat goes out the stack, 1/3 is converted to electricity, so we multiply by 3. For the USA, this is remarkably accurate for a whole number.) Typically $77.3 \times 1.15 =$ about 89 kg-C/MMBtu that gets through to your house as electricity. Line losses consume some. That's obviously a lot more carbon per Btu than for natural gas. HOWEVER If the electricity is used to run a geothermal heat pump, rather than a resistance heater, electricity looks a lot better. Also, be aware that in reality, only about 60% of your electricity comes from fossil fuel combustion. THEREFORE It can be misleading to compare fuels unless all factors are considered. Gregg Marland is the expert on corn and wood; below is his answer to the rest of your question. I would add that a molecule of CO₂ from wood combustion absorbs infrared radiation just as well as a molecule of CO₂ produced by fossil fuel combustion, and so we have to know exactly what fraction of carbon from wood combustion is actually re-sequestered via new growth. From Gregg Current accounting convention is that there are no CO₂ emissions from combustion of corn or wood. This is based on the premise that the corn or wood will be regrown so that the CO₂ that is released by combustion will be subsequently removed from the atmosphere by photosynthesis in a sustainable cycle. In truth, of course, it is not quite so simple, because burning the wood requires that you plant and grow the tree and harvest the wood and haul it to your house - all of which take fossil fuels. So the answer to the question really depends on the details of the question. If the question is simply, how much CO₂ comes out of my smoke stack when I burn wood, the answer is just slightly larger than for coal. Given the 25.76 below, the value for wood is about 27. The difference is in large measure because the wood has more moisture in it and part of the energy from combustion is used up in vaporizing the water. I do not have a number for corn, but my speculation would be that it is very similar to for wood, with a very large dependence on the moisture content at the time that it is burned. TJ and Gregg

Q I'm looking for updated CO₂ data from Mauna Loa. I found this page, <http://cdiac.ornl.gov/ftp/trends/CO2/maunaloaCO2> linked from your site but it only goes up to 2004. I'm assuming someone has the data through 2006. (11/29/07)

A Dear Thomas Pfaff, I will send you an e-mail with an attachment. TJ Blasing

Q What are the specific years since 1850 that CO₂ levels in the atmosphere declined or stayed flat year-over-year? (11/25/07)

A Dear Noel Sheppard, What are the specific years since 1850 that CO₂ levels in the atmosphere declined or stayed flat year-over-year? Continuous records have been kept at Mauna Loa since about 1960. You may find the record by looking at "Atmospheric carbon dioxide record from Mauna Loa" on our web site under "products". Derived data from ice cores, also available under the "products" section, include Historical CO₂ record from the Siple Station ice core, and Historical CO₂ Records from the Law Dome DE08, DE08-2, and DSS Ice Cores. These data represent integrated values over more than one year, and are not as precise as the Mauna Loa data, so I wouldn't want to make inferences as temporally precise as "year-to-year". While there may have been some year-to-year declines as one gets back into the 1850 range, there don't seem to have been any identifiable year-to-year declines since then. If you meant declines over periods of several years, then the Law-Dome data suggest that 1500-1750 represented years of decline of a few parts per million. TJ Blasing

Q "A good estimate is that you will discharge 19.6 pounds of CO₂ from burning 1 gallon of gasoline." If a liquid gallon weighs only about 7 lbs., how can the results of combusting it weigh over 19 lbs? It gains 8 lbs. when it turns from a liquid to a gas? (11/22/07)

A Dear Kenton Shepard, Actually, yes. The carbon (atomic weight = 12) is oxidized to CO₂ (molecular weight = 44) and, when the result is expressed as CO₂, the oxygen is included. Of course, there is some hydrogen in the gasoline as well, and that combusts to water vapor which will eventually condense and rain out. Sincerely, TJ Blasing

Q I would like to use one of your graphs in my forthcoming book. The book is titled Heidegger, Politics and Climate Change: Risking it all and will be coming out with Continuum Books next year. The graph I am interested in reproducing (unless you have a more recent one that you think would be more appropriate) is - Atmospheric CO₂ derived from the Siple Station ice core (1984). Many thanks, Ruth Irwin (11/18/07)

A Dear Dr. Irwin, Thank you for your interest in graphics produced by the Carbon Dioxide Information Analysis Center (CDIAC). You have our unrestricted permission to reproduce the graph depicting the historical atmospheric CO₂ record from Siple Station. I suggest the following credit for the graph: Neftel et al. Data available from the Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. Regards, Tom Boden Carbon

Q Folks: Do you have CO₂ emissions numbers aggregated for all the various energy sources as a function of MGW electricity generation I recently ran across a table of such numbers but have not source for it, not can I check it's accuracy. I want to use the numbers in an article, but w/o a check, I can't. I'd be happy to mail you the data by reply email message (11/13/07)

A Dear Harry (doc) Babad, We appreciate your comment/feedback on the CDIA Web site. We do not compile our national CO₂ estimates with easy cross-validation to individual sources of electricity generation. Sincerely, Robert Andres

Q I've been asked to find the most up-to-date information on CO₂ emissions by country - total and per capita. I have found the national ranking tables on your site (by Gregg Marland et al). However I am confused because they appear to differ from the stats on the UN MDG Indicator site (<http://mdgs.un.org/unsd/mdg/Data.aspx>). For example, for the UK, your data has CO₂ emissions per capita at 2.67 metric tons - while the UN MDG site has the figure at 9.7934 (attributed to CDIA). I'd really appreciate it if someone could get back to me on this. Many thanks Emily Jones (Producer, BBC News) (11/12/07)

A Dear Emily Jones, You are not the first to ask about this; the difference has confused many people (some with considerable technical expertise) over the years. See our "frequently asked questions" (FAQ), section, question 9, at: <http://cdiacornl.gov/faq.html>. The answer is: We report carbon, they report carbon dioxide. The difference is between carbon (atomic weight 12) and carbon dioxide (molecular weight 44). $2.67 \times 44/12 = \text{exactly } 9.79$. Sincerely, TJ Blasing

Q I would like to know the total annual amount of carbon admitted to the atmosphere in millions of tons. Hopefully this number will include fossil fuels, deforestation, burning of forests, volcanoes, etc. and I would like to know the world total per year. Thank you (11/5/07)

A Dear Ms. Warner, Thank you for your question regarding fluxes in the carbon cycle. The answer to your question is not a simple one as carbon is continually emitted and withdrawn from the atmosphere. As you may know there are several natural and anthropogenic sources to the atmosphere as well as several natural and anthropogenic sinks which draw carbon from the atmosphere. All of these individual sources and sinks are not always individually monitored but their sum is well known. The majority of the following answer was taken from the latest IPCC report which was recently released and is available at <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>. The report contains estimates for the fluxes from the 1980s, 1990s, and 2000-2005. You can find these estimates on page 26 of the report (this page is located in the Technical Summary section of the report). The IPCC report lists fluxes in Gt C per year; for the following I have converted these values into millions of metric tonnes per year as I think you requested in your initial inquiry. The conversion factor is 1000 to go from Gt C per year to million tonnes C per year. I was unsure if you were interested in the final unit being metric tonnes (equal to 1000 kg) or short tons (English units equal to 2000 pounds). If you are interested in short tons, then the following metric tonnes need to be multiplied by 1.102. Atmospheric increase: 4100 +/- 100 million metric tonnes per year; fossil fuel carbon dioxide emissions: 7200 +/- 300 million metric tonnes per year; net ocean to atmosphere flux: -2200 +/- 500 million metric tonnes per year; net land to atmosphere flux: -900 +/- 600 million metric tonnes per year. The negative sign on the last two entries indicates that the flux was from the atmosphere to the oceans or land. The above numbers were given as an average year in the 2000-2005 time frame. A recent study by Morner and Etiope (2002, Global and Planetary Change, pp. 185-203) estimated volcanic fluxes to the atmosphere as 300 million tonnes C per year. I hope this answers your questions about fluxes in the global carbon cycle. Sincerely, Robert Andres

Q Hi, I'm writing to you from Sierra Magazine. I am fact-checking an article about CO₂ emissions and was hoping you could answer a few questions. How much CO₂ does an average car emit per mile? Is it true that leaving the lights on at home can emit thousands of pounds of CO₂ per year? The sooner you can get back to me the better. Thanks for your help. Best, Lea Hartog, Editorial Intern, Sierra Magazine (415) 977-5608, sierra.intern@sierraclub.org (11/1/07)

A Hi Lea, The answer to the first question depends entirely on how many miles per gallon the "average" car gets. 2.4 kilograms of carbon per gallon = 8.8 kilograms of carbon dioxide = about 19.4 lbs CO₂ / gallon of gasoline. If an "average" car gets 20 mpg (probably not far off), then it's about a pound of CO₂ per mile. 2nd question: Depends on your utility district; for TVA we use around 165 g-C per kWh generated. This means if I leave a 100 Watt light bulb on for all 8760 hours of 2007, I use 876000 watt hours = 876 kWh X 0.165 kg-C/kWh = 145 kg-C = 529 kg-CO₂ = 1166 lbs of CO₂ if my arithmetic is correct. "Thousands of pounds" sounds exaggerated but not out of the question if you have outside lights and leave them on all night every night, for example. My figures are for carbon emissions per kWh of electrical energy generated by the utility; this is a useful number for TVA. Loss of electricity through power lines eats up around 9% of electrical energy generated so the answer you want is probably closer to $1166/0.91 = 1281$ lbs. EPA also subtracts energy used by the utility (electricity actually provided to consumers), so they get around 1.55 lb CO₂/kWh, or about 1358 lbs of CO₂ per year in the calculation above. Hope these numbers are useful. Sincerely, TJ Blasing, blasingtj@ornl.gov, CDIA

Q | Why can't we just build greenhouses with tropical rain forests adjacent to power plants? The heat and CO₂ from the plant would help the forest (10/31/07)

A | Dear Eric, Thank you for your question to the CDIAC Web site. I wish combatting the consequences of fossil fuel combustion was so easy. The problem is the size of the greenhouse you would have to build next to each power plant to offset the associated CO₂ releases and the energy needed to run the greenhouse. To put it in perspective, a study was done several years ago to determine how large a land area would need to be planted with fast-growing, easy maintenance trees to offset one year's worth of global fossil fuel CO₂ releases (i.e., ~8 billion tons of carbon). The answer was you would have to plant an area the size of Australia and actively manage (e.g., fertilize, optimal planting distance, spray to reduce herbivory, etc.) it too! Reforestation helps but is not the solution. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | How to join in the FACE network (<http://cdiac.ornl.gov/programs/FACE/face.html>)? We have established a system to deliver carbon dioxide to field based experiments (Free Air Carbon Dioxide Enrichment- FACE) in China, with six 4 m diameter elevated carbon dioxide rings and two control rings at Changping Beijing, China. We will do experiment for wheat and soybean in China. The first experimental crop - soybean - was sown on May 17. I think it is quite important to keep in touch with other scientists and have discussion of all aspects of Free Air Carbon dioxide Enrichment (FACE) experiments. I found the FACE website. Could you help us to join in the website? Wait for your reply, please email to me. best wishes. Regards, Han Xue, Institute of Environment and Sustainable Development in Agriculture, CAAS (10/31/07)

A | Dear Han Xue, There is no network to join. Just send your material to Bai Yang at: yangb@ornl.gov. Sincerely, TJ Blasing

Q | On the page <http://cdiac.ornl.gov/trends/CO2/>, the location of Law Dome is incorrectly given as Greenland rather than Antarctica (10/27/07)

A | Dear Jerry, Thank you very much for pointing out this error! We have made the correction. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | Why do the CO₂ measurements at cdiac.ornl.gov/trends/trends.htm stop at 2004? (10/26/07)

A | Dear Jerry, Thank you for your question to the Carbon Dioxide Information Analysis Center (CDIAC). Our atmospheric CO₂ measurement records are a bit dated. Updates to records from Scripps Institution of Oceanography (SIO) including the Mauna Loa record have been slow coming due to the untimely death of Dave Keeling in 2005. We continue to interact with SIO and we expect updates to the time series soon. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q | what is the amount of CO₂ emissions per one gal. of diesel fuel? (10/19/07)

A | Dear victorzepeda, Diesel fuel is usually distillate fuel; 2.75 kg-C/gallon of fuel is a pretty good number for distillate fuel. The Code of Federal Regulations (40 CFR 600.113) provides values for carbon content per gallon of gasoline and diesel fuel which EPA uses in calculating the fuel economy of vehicles. Diesel carbon content per gallon: 2,778 grams. EPA and I both use 99% combustion efficiency, $0.99 \times 2.778 = 2.75$. To convert from carbon to CO₂, multiply by 3.66. Answer is 10.07 kg-CO₂/gallon. If you still use pounds instead of kg, then the answer is: 22.2 lbs CO₂/gallon. Sincerely, TJ

Q | Please advise me by email as to where I can obtain the following data files: 1. Arctic air temperature vs year from 1880 to as recent as possible. 2. Solar Irradiance vs year from 1880 to as recent as possible. 3. World hydrocarbon use vs year from 1880 to as recent as possible. I am checking the fig. 3 graph in "Environmental Effects of Increased Atmospheric Carbon Dioxide" by A. Robinson, N. Robinson and W. Soon of Oregon Institute of Science and Medicine (10/18/07)

A | Dear Dr. Newman, Thank you for your question to the Carbon Dioxide Information Analysis Center (CDIAC) web site. I have not read or seen the Robinson et al. book you reference. Without the benefit of seeing the book and actual references for the data you mention, I will have to point you to related, possibly identical, sources. I hope the data sources listed below help and please let me know if I may be of further assistance. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov. For long-term, Arctic temperature records dating back to 1880 <http://cdiac.ornl.gov/trends/temp/hansen/hansen.html> <http://cdiac.ornl.gov/ftp/trends/temp/lugin/60-90N.dat> For solar irradiance data <http://www.ngdc.noaa.gov/stp/SOLAR/ftp/solarirradiance.html> http://www.astro.phys.ethz.ch/papers/fligge/solfli_rev.pdf For world hydrocarbon (i.e., fossil fuel) use as represented by CO₂ releases from fossil fuel use since 1880 http://cdiac.ornl.gov/trends/emis/tre_glob.htm

Q | Kansas is deciding on whether to permit two new coal fired power plants. Where can I find the per capita CO₂ emissions now versus what it would be if they get approved? (10/16/07)

A | Dear richard sumpter, http://epa.gov/climatechange/emissions/download/CO2FFC_2004.pdf will give you reasonably close-to-current CO₂ emissions by state. EPA numbers are probably best for environmental assessment purposes and probably are as

accurate as anyone's. We initiated the state-data project several years ago, and then passed it on to DoE. EPA has since taken it on also, but neither publishes per-capita numbers that I can find. Traditionally states with high coal reserves and low populations excel in the per-capita emissions department. An alternative is to haul the coal somewhere else and burn it there, but the energy to haul the coal is then added. Population data can be found at <http://quickfacts.census.gov/qfd/states/20000.html>. Of course, if these plants are not built in Kansas, will they be built somewhere else? Sincerely, TJ

Q Can you please describe, or give references for, how the yearly global CO₂ times series (1750-2004) is estimated? I want to use this series as an exercise in time series estimation for my biostatistics course. Thank you. W.O'Neill (10/15/07)

A Dear Dr. O'Neill, We appreciate your question to the CDIAC Web site. Our global, regional, and national time series for CO₂ releases from fossil fuel consumption and cement production are based primarily on published energy statistics (Etamad et al. 1991, United Nations 2006) and cement production data (U.S. Bureau of Mines, 2007). Emission estimates are calculated using the methods described in Marland and Marland (1984). Please see http://cdiac.esd.ornl.gov/trends/emis/meth_reg.htm for further details (e.g., carbon coefficients, oxidation rates, etc.). If you have further questions, please contact me. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842

Q How is it that you calculate only 3,444k tons of CO₂ emissions in Vietnam due to cement manufacturing in 2004 (<http://cdiac.ornl.gov/ftp/trends/emissions/vie.dat>) when Vietnam produced over 25 mm tons of cement in 2004 and, generally, one ton of cement = one ton of CO₂? Even if you factor in the non-fuel related emissions, the production of clinkers should generate .5 tons of CO₂ for every ton of Portland cement produced. . . thank you for helping me to understand John Zuckerman (10/2/07)

A Dear Mr. Zuckerman, Thank you for your inquiry regarding our calculations on carbon dioxide emissions from cement production in Vietnam in 2004. I will next outline the algorithm we use to derive this carbon dioxide emission estimate. The calculation begins with an estimate of 25,320 thousand metric tonnes of cement produced in Vietnam. This estimate was provided by the USGS Minerals Yearbook (<http://minerals.usgs.gov/minerals/pubs/commodity/cement/cemenmy05.pdf>, p. 16.37). The next step in the calculation is to multiply this production quantity by 0.136. The result of this calculation is 3443.52 thousand metric tonnes C, whose rounded number 3444 is what is reported on the CDIAC web page you referenced in your initial query (<http://cdiac.esd.ornl.gov/ftp/trends/emissions/vie.dat>). This 0.136 conversion factor is the product of two terms: the molar mass ratio of carbon (C) to calcium oxide (CaO) in the clinker and the average fraction of CaO in the cement. Mathematically this results in $(12.04 \text{ g/mol C} / 56.08 \text{ g/mol CaO}) * 0.635 = 0.136$. The final calculation is then $25,320 \text{ thousand metric tonnes cement} * 0.136 \text{ thousand metric tonnes C / thousand metric tonnes cement} = 3443.52 \text{ thousand metric tonnes C}$. I hope this explanation of our calculation procedure satisfactorily answers your question. Sincerely, Robert Andres

Q For the purpose of this probably naive question, assume all rain forests are totally depleted by a combination of direct deforestation and climate change. Reportedly rain forests contribute more than 20% of the world's oxygen. Other than climate changes caused by the forests' depletion, would it have any effect on the gas makeup of the air, and if so, what effect would it have? Jerry Forsch (10/2/07)

A Dear Jerry Forsch, Tropical forests do indeed release about 20% of the oxygen released from CO₂ as the result of photosynthesis - terrestrial and oceanic. The carbon is stored in the form of organic matter, nearly all of which eventually dies and decomposes. During decomposition, the organic matter is converted back to CO₂ which consumes oxygen. The net result is that very little change in the concentration of oxygen in the atmosphere. So the impact from the reduction of photosynthesis is not important. Now, tropical ecosystems contain 880×10^{15} grams of carbon that if allowed to decompose would increase the atmospheric concentration of CO₂ by 413 ppm or more than 2x the current CO₂ concentration. Since each ppm increase in CO₂ results in a ppm decrease in oxygen, the oxygen concentration of the atmosphere would, given all other things equal (the oxygen dissolved in sea water would degas a bit to equilibrate with the new atmospheric concentrations so the actual change would be smaller), would decrease by 413 ppm. Since the atmospheric concentration of oxygen is about 20% this is an insignificant change. Sincerely, Mac Post

Q Is there a statistic to be had about the amount of CO₂ emissions a truck (Fully Loaded) has per mile driven in the US? and if there also are statistics of this matter for Trains and Barges (In the US). I hope you can assist me with this question. Thank you in advance. Regards.. (9/24/07)

A Dear Aldo Silvano, Of course, it depends on the gas mileage of the train or truck. Most trains and trucks run on diesel fuel. I would use 2.75 kg-C/gallon of fuel = about 0.725 kg-C/liter of fuel. For small trucks running on motor gasoline, I would use about 2.38 kg-C/gallon = 0.63 kg-C/liter. Sincerely, TJ Blasing

Q Does Carbon dioxide have an odor? What I mean is does it smell like anything or is it odorless? I am doing an experiment on yeast and I was wondering if carbon dioxide had an overbearing odor that would cover up the slight smell of sugar. Thank you for your time (9/24/07)

A Dear Jessica, In general, CO₂ is odorless. However, at very high concentrations, some people claim it has an acidic smell. According to this web site which uses British spellings (and also according to some other sites) <http://www.environment>

agency.gov.uk/business/444255/446867/255244/substances/31/ "At environmental temperatures carbon dioxide occurs as a colourless gas, denser than air. It is essentially odourless though it can have a slightly acidic smell at very high concentrations" AND, According to: Universal Industrial Gases, Inc. 2200 Northwood Avenue, Suite 3 Easton, PA 18045-2239 USA (610) 559-7967. "Carbon Dioxide gas is colorless At low concentrations the gas is odorless At higher concentrations it has a sharp, acidic odor. It will act as an asphyxiant and an irritant." I interpret "higher concentrations" to mean in excess of about 20,000 ppm. They gave a phone number so apparently it's OK to call them to find out more. Sincerely, TJ Blasing

Q Is Carbon Dioxide gas classified as toxic or not. Please advise. Thanks Alan James (9/21/07)

A Alan, The following is cut and pasted from: American Conference of Governmental Industrial Hygienists (ACGIH) recommended exposure limit for carbon dioxide gas? TIME-WEIGHTED AVERAGE (TLV-TWA): 5,000 ppm STEL: 30,000 ppm TLV BASIS - CRITICAL EFFECT(S): Asphyxiation NOTE In many Canadian jurisdictions exposure limits are similar to the ACGIH TLVs. Since the manner in which exposure limits are established, interpreted and implemented can vary, obtain detailed information from the appropriate government agency in each jurisdiction STEL = Short-Term Exposure Limit - TJ The following is from: Universal Industrial Gases, Inc. 2200 Northwood Avenue, Suite 3 Easton, PA 18045-2239 USA (610) 559-7967. Carbon Dioxide gas is colorless At low concentrations the gas is odorless At higher concentrations it has a sharp, acidic odor. It will act as an asphyxiant and an irritant. Carbon Dioxide is a powerful cerebral dilator. At concentrations between 2 and 10%, Carbon Dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Above 8% nausea and vomiting appear. Above 10%, suffocation and death can occur within minutes. 2% = 20,000 ppm - TJ Sincerely, TJ Blasing

Q I am interested in using the soil organic carbon data from <http://cdiac.ornl.gov/ndps/ndp018.html> but need to identify which countries the data comes from. Is there a code for the country abbreviations in the profile numbers? Regards Leanne (9/9/07)

A Dear Leanne Brown, According to Mac Post: The data is grouped by continental region: North America, South America, Asia, Europe, Australia, Africa, Caribbean, Pacific Islands. In addition, the last 2 letters of the profile name gives an indication of the country (JP = Japan, SP = Spain, IC = Ivory Coast, SB = Siberia, VN = Vietnam, etc.). For ones in the US, the last 2 letters indicate the state. Unfortunately there is not a key for these. If there is some doubt, use the lat/lon to check the country. Please let me know if you need more information. Sincerely, T.J. Blasing

Q Hello, Where do you get your 2004 CO₂ Emission mass data from? Thank you, Andy (9/4/07)

A Dear Andy, We appreciate your question to the CDIAc Web site. Our fossil fuel emission estimates are calculated using the methods of Marland and Rotty (1984). The energy statistics (e.g., amount of crude oil produced by Saudi Arabia in 2004) used to determine the "net apparent consumption" of fossil fuels by country, year, and fuel type come from the United Nations (UNSTAT, 2006). Carbon coefficients and oxidation rates come largely from published commercial fuel chemistry databases (e.g. BP, Shell, Gas research Institut). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear CDIAc, What is the concentration of argon gas in the atmosphere before the industrial revolution, say 150-200 years ago. If this information is not available to you, who may have this information? Thanks Nabil Swedan (8/30/07)

A Dear Nabil Swedan, The source of argon in the atmosphere is the (VERY slow) decay of potassium-40. It has been about 0.94% of the atmosphere by volume, since Ramsey first discovered it over 100 years ago. Some of it has been removed from the atmosphere for various applications but this is a very small percentage of the total, and it eventually leaks back. We appreciate your comment/feedback on the CDIAc Web site. Sincerely,

Q Hello, We are a small company interested in measuring our carbon footprint. Does your organization do this? If not, can you direct me to an organization that does measuring carbon footprint? Thank you, Lydia (8/20/07)

A Dear Lydia, Thank you for your comment to the CDIAc web site. We do not calculate or measure individual carbon footprints however, I suggest you look at the two URLs listed below for a methodology to calculate carbon footprints and our own calculations of US releases of CO₂ from fossil fuel use and cement production. Please let me know if we can be of further assistance. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center (CDIAc) Oak Ridge National Laboratory bodent@ornl.gov <http://www.carbonfootprint.com> http://cdiac.ornl.gov/trends/emis/tre_usa.htm

Q How much carbon dioxide is produced from the combustion of ethanol, methanol, and B100 biodiesel (combustion only, not life cycle CO₂ emissions)? (8/14/07)

A Dear Stephen A. Knudsen, Sorry this took so long. Somehow your question and a couple of others had "gotten lost in the shuffle". EPA has an excellent and authoritative little book Direct Emissions from Mobile Combustion Sources which you should be able to find by googling on the title, maybe combined with "EPA". I can't find methanol in there. I will send you something I do have on methanol which was originally done at EPA. And (you probably already know this) you won't get as many

miles per gallon with some of the biofuels Sincerely, TJ Blasing

Q Note My Email Adress is vonEhrlich@lmu.de not .com however it did not work with .de To whom it may concern, I have two questions regarding CO₂ Emissions 1) Are the 315 Gt CO₂ emissions calculated by Marland et. al. gross emissions from fuel combustion or does it already take into account that a certain fraction is absorbed by land, biomass or the oceans 2) Is there an estimate about the absolute amount of CO₂ in the atmosphere I have only found information about the share of carbon dioxide (430 ppm); is it possible to give a rough estimate about the total amount of CO₂ for example in Gigatonnes that are in the atmosphere Thank you very much for your help, sincerely yours, Maximilian von Ehrlich (8/10/07)

A Dear Maximilian von Ehrlich, We appreciate your comment/feedback on the CDIAC Web site. I will answer the 2nd part and leave the first part to Gregg Marland. The conversion factor from ppm to Pg (=Gt) is 2.12. Currently there are around 380 ppm in the atmosphere, 430 sounds like a local figure near an urban/industrial area. Anyway, for the atmosphere as a whole, 380 X 2.12 = 805 Pg (805 Gt). Sincerely, TJ Blasing

Q I have downloaded your data on CO₂ emissions. The problem I encountered was that it was in metric tonnes of Carbon. In this scenario I couldn't get the data to fit other statistics using CO₂ equivalents. My question is, how is your data (for instance of global emission of ca. 7.000 mill metric tons in 2004) is convertible into the ca. 27.000 mill CO₂ equivalents it is listed as in the IPCC report? (8/8/07)

A Dear Daria, Our fossil fuel emission estimates are reported as carbon. To convert to CO₂, as is done in the IPCC report, multiply our estimates by 3.667. This multiplication factor is the difference in the molecular weight between CO₂ and C (i.e., 44/12). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Ladies and Gentlemen We have developed systems to make carbon sequestration profitable and create a new carbon economy instead of treating it as waste. These systems are under Patents Pending. We have produced a book from our website content. You can see all about it at our website at: <http://www.geocities.com/profadrrian/SCAE.html> Adrian Vance (8/7/07)

A Dear Adrian, Thank you for your e-mail message and good luck with the patent(s). I have passed your URL on to folks here involved in carbon sequestration and mitigation options. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q would you please send me total CO₂ emissions data, population of all countries of 1990? (8/2/07)

A Dear dibakar chakraborty We appreciate your comment/feedback on the CDIAC Web site. See: http://cdiac.ornl.gov/trends/emis/em_cont.htm Sincerely, TJ Blasing

Q I saw your page at <http://cdiac.ornl.gov/epubs/cdiac/cdiac29/cdiac29.html> and wanted to suggest a resource to add: <http://www.FreePatentsOnline.com>. This site allows free patent searching, free PDF downloading, free alerts, and more. It is a good resource for IP attorneys, patent searchers, scientific researchers, students, and small businesses (8/1/07)

A Dear James, Thanks for the resource information. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am creating curriculum on global warming and am looking for a schematic that breaks down CO₂ emission (hopefully as percentage) by sector (such as Residential, Commercial, Industrial, transportation). I have a diagram that offers this type of information and even breaks the emission information down into subcategories of each sector, but the information is quite outdated. I could send an image of what I am trying to update if that would help. Thank you for your time. (8/1/07)

A Dear Dan Flerlage, We appreciate your comment/feedback on the CDIAC Web site. In addition to the material Gregg Marland suggested, I would offer the EPA's annual greenhouse gas emissions inventory. You can find it at: <http://epa.gov/climatechange/emissions/usinventoryreport07.html> Sincerely, TJ Blasing

Q I am trying to find disaggregated data for several countries GHG emissions - China, South Africa and Australia - as we intend building Zero (fossil) Energy Developments there. The data I came across on Earth Trends [1] mentions CDIAC as its source, so I was wondering if you could point me out to the primary data, if it is publicly available? Data on both China and South Africa are rather elusive. Kind Regards, Marc Kaufmann (7/27/07)

A Dear Marc, Our data center, the Carbon Dioxide Information Analysis Center (CDIAC), compiles and makes available national estimates of CO₂ releases from fossil fuel consumption and cement production. The latest national estimates, including China and South Africa, may be found at the following URL: <http://cdiac.ornl.gov/trends/emis/top2004.tot>. Longer time series for these countries, as well as all countries of the world, may be found at http://cdiac.ornl.gov/ftp/ndp030/nation1751_2004.ems

Q you have put that North America is just USA & Canada, and that's wrong. Mexico is North America too. thanks (7/24/07)

A Dear Frank, Thanks for your comment to the CDIAC website. I agree. Most of us would now consider Mexico to be part of North America and trade agreements like NAFTA certainly support your claim. The regional definitions used in our fossil fuel emission presentations reflect historical definitions used by the United Nations and used by some of the early pioneers of the emission calculations (e.g., Ralph Rotty). The beauty of our database and the availability of the national estimates is that it permits users to define regions any way they wish. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear webmaster, I am writing to request permission to reproduce the graphic found at the following URL: http://cdiac.ornl.gov/trends/CO2/graphics/mlo145e_thru04.pdf (it is linked to from <http://cdiac.ornl.gov/trends/CO2/sio-mlo.htm>) Dr. Kim Kastens of the Lamont-Doherty Earth Observatory of Columbia University is submitting a publication entitled "Multiple Modes of Inquiry in the Earth Sciences" to The Science Teacher, the National Science Teachers Association's peer-reviewed scholarly journal for secondary science teachers. Dr. Kastens would like permission to reproduce the previously mentioned image in a 2-page figure which will accompany the article. I have attached the first page of the figure as a pdf so that you may see how the image would be used if permission is granted. Thank you for your help in obtaining this permission. Sincerely, Linda Pistoletti (7/23/07)

A Dear Linda, You have our permission to reproduce the Mauna Loa figure which appears on the Carbon Dioxide Information Analysis Center (CDIAC) web site. I suggest the following citation: Source: Dave Keeling and Tim Whorf, Scripps Institution of Oceanography Data provided by the Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory. Sincerely, Tom Boden

Q Dear Sir, In FACE experiments, how much is the CO₂ requirement (in general). I would imagine it will depend upon face tube size, wind velocity, etc. but some figure for say 8 m FACE diameter. Secondly, do you use CO₂ generators or CO₂ cylinders to meet CO₂ demand in FACE experiments? Can I know the source for CO₂ that could be used in face experiments? (7/18/07)

A Dear Sanjay Kumar, We appreciate your comment/feedback on the CDIAC Web site. The person who can answer these questions is Rich Norby. Email Address: norbyrj@ornl.gov Sincerely, TJ

Q I am trying to find out the effect on the ozone if we could reduce the consumption of 2.3 billion kWh of energy produced by coal. How would this reduction of the (carbon per se) affect the greenhouse problem or ozone problem? (7/18/07)

A Dear Gilbert, We appreciate your question to the CDIAC Web site. On average, approximately 0.746 tons of carbon are released for each ton of coal equivalent consumed and the average oxidation rate for coal is ~98%. Reduced reliance on coal for energy and conversion to renewable energy sources (e.g., hydro), especially for countries like China, would help reduce carbon releases to the atmosphere from fossil fuel consumption. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Can you please indicate what reasons there could be for discrepancies between your estimates and those by the DOE in the IEA? I understand that their estimates do not include cement manufacturing, for instance. But if we were to look at examples of nations with no bunkering and no cement manufacturing, shouldn't your and their estimates for those nations coincide? Any clarification you can offer is much appreciated. Thanks! Paulina Essunger (7/15/07)

A Dear Paulina, Thank you for your question to the CDIAC Web site. I myself have not done a detailed comparison of our emission estimates to DOE's, but several possible differences quickly come to mind. For example, we use generic global carbon coefficients for four major fuel categories (hard coal, soft coal, natural gas, and crude oil). We know individual fuels differ in quality and carbon content and also differ by region and state (e.g., Wyoming coal is different than West Virginia coal). The range in carbon content differences is relatively small. DOE should be in a position to have detailed fuel quality data by individual fuel and region, particularly for the US, and may incorporate them into their calculations. We do not since the range is relatively small and our feeling is the underlying energy statistics have more uncertainty than do the carbon coefficients and oxidation rates. Do the DOE/EIA or IEA (Paris) estimates include gas flaring as ours do? How do they handle fuels used for non-energy purposes (e.g., asphalt)? We do not include emissions from fuels used for non-energy purposes in our national estimates but do for our global estimates. You already mentioned the treatment of bunker fuels which is another potential source of differences. My last parting comment is that my impression from those who have done detailed comparisons is that once you tease out all the reporting differences and compare apples to apples, the estimates are remarkably similar (within 5% for most countries). Please feel free to contact me if you wish to discuss this further. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov (865) 241 4842

Q Hi, It seems that the CO₂ emissions from cement production includes only the chemical reaction release (limestone → clinker), not the CO₂ from fuel burning/electricity required to heat the kiln and grind the materials. Is this true? Thanks, Julia (7/13/07)

A Dear Julia Schmitt, You are correct. I will be e-mailing you a reply with an attachment of an excellent paper on this subject by Lisa Hanle. We include the fossil fuel under fossil-fuel combustion, but Lisa has broken it out by carbon emitted from fuel use to heat the kilns. We appreciate your comment/feedback on the CDIAC Web site. Sincerely, TJ

Q I am authoring a chapter of a centennial publication for the University of Michigan Biological Station addressing climate change. I would like to request permission to use the CO₂ data from Mauna Loa from 1958-2004 as cited below. Please let me know if there is anything further I need to do. Thank you very much for your time. Sincerely, Steve Bertman
Keeling C.D. and T.P. Whorf 2005. Atmospheric CO₂ records from sites in the SIO air sampling network. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. (7/12/07)

A Dear Steve Bertman, We appreciate your comment/feedback on the CDIAC Web site. The data are out there for the public to use; a citation as indicated is all that is requested. Sincerely, TJ Blasing

Q How is the Carbon dioxide constituent of air composition assayed, analysed, determined by the air quality standards personnel/ are there more than one method to utilize/ What are the methods used to determine CO₂ in air percent by weight or percent by volume or both? Where is the citation for the literature available to the public? (7/11/07)

A Dear John, We appreciate your comment/feedback on the CDIAC Web site. Precision CO₂ determinations in air are made using an infrared gas analyzer. I suggest you visit the websites of the major manufacturers (e.g., Siemens, Licor) for details on the instrumentation performance and sampling protocols. For details on calibration gases related to high-precision (within 0.1 ppmv) CO₂ measurements, I suggest you go to the following website: <http://www.esrl.noaa.gov/gmd/ccgg/refgases/index.html>. Hope this helps. Sincerely, Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory

Q I'm a master student and now is doing research on carbon dioxide emission in Malaysia. I just got the data emission from your website you had mentioned that all the values are estimation. Here, I want to ask you the method of calculation on how you estimate the carbon dioxide emission. Hopefully, I can hear from you soon. tq. (7/10/07)

A Dear nor sharliza, We appreciate your comment/feedback on the CDIAC Web site. See: Marland, G., and R.M. Rotty. 1984. Carbon dioxide emissions from fossil fuels: A procedure for estimation and results for 1950-82. *Tellus* 36(B):232-61. Sincerely, TJ Blasing

Q How is the carbon dioxide potential for true global warming calculated? I used to think heat capacities/heat energies of the atmosphere & its constituents would explain it. But even if all the oxygen in the air was converted to CO₂, the specific heat capacity (SHC) of air (~1.010 kJ/(kg*K)) would only change to ~0.996 kJ/(kg*K), giving only a 1.0146 degree K increase with a heat energy of 1.010 kJ. This is only 0.0146 degrees higher than at the original SHC of 1.010. Help! Steve (6/28/07)

A Dear Stephen T. David, We appreciate your comment/feedback on the CDIAC Web site. The GWP (sometimes called Greenhouse Warming Potential, and sometimes called Global Warming Potential) is calculated from 3 factors. One of them has to do with the atmospheric lifetime of a "typical" molecule; methane stays around for about 12 years or so, but some CFCs stay around for hundreds of years (long half-life, so to speak). GWPs are an integral over some specified length of time (IPCC official length is 100 years), so for 100 years, it would have to do with how many molecules of substance X at the beginning of 100 years are still around 100 years later. The other 2 factors have to do with absorption bands. If you add some gas which absorbs only in a wavelength already absorbed by water vapor, for example, you will not contribute much to radiative forcing because those photons are already being absorbed anyway. Conversely, if you put something into the atmosphere which absorbs in a wavelength where no absorption is currently going on, you actually have an effect, and usually quite a large one, on a molecule-for-molecule basis. The last factor depends on the substance's absorption bands relative to the Planck curve in which the earth emits. The maximum emissions for the earth's Planck curve are around 10 micrometers, so a gas absorbing in that region will be more effective than a gas absorbing at, say, 2 micrometers where relatively little radiative emission from the earth's surface is taking place. There is not much absorption between about 8 and 13 microns, except for some narrow oxygen/ozone bands, so the addition of a gas which absorbs strongly in these wavelengths will have a relatively large effect on radiative forcing. CFCs often fall into this category. That's it in a nutshell. More information can be found at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Pub_Ch02.pdf. Sincerely, T.J. Blasing

Q How can I calculate the carbon emissions produced for typical electricity and gas imported to our site? We are importing 12,025,659 kBtu/yr in electricity (80% hydro, 12% gas, 7% coal, 1% renewable) and 6,651,854 kBtu/yr in gas. Also, how much carbon is typically emitted during on-site gas combustion? This is for a master plan of a 5 block site. (6/27/07)

A Dear Zafiro Papastratakos, From the Btu realized from combustion of a fossil fuel, it is fairly easy to obtain a pretty good estimate of the carbon emissions. You can get even closer if you know the grade of the oil and the rank of the coal. I would use 14.5 g-C/1000 Btu for gas, 20 g-C/1000 Btu for oil, and 26 g-C/1000 Btu for coal. Some more precise information can be

obtained from the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1009-2005, published by EPA and on the web. Appendix 2 (page A 37 or so) We appreciate your comment/feedback on the CDIAC Web site. Sincerely, TJ Blasing

Q What do you feel will be the long and short term impacts of climate change to the environment- global, U.S., and specific site? How do you feel that small (rurally classified) city governments will impact this, how can we be proactive without being too restrictive? We need all sources of income, industry and growth, but also want to protect our natural resources. Please advise (6/27/07)

A Dear Virginia, We appreciate your question to the CDIAC Web site. My advice is simple and follows the old adage - "Think Globally, Act Locally". I would encourage you to do the things in your own daily life that make good economic, environmental and practical sense for you. Simple conservation (e.g., turn off lights when you leave a room, bike to the local library rather than driving) and efficiency (drive a fuel efficient vehicle) measures are good for you and the Earth system. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

Q How would I go about plotting out a metrics system to calculate how much CO₂ emissions the construction of a building would produce? (6/26/07)

A Dear Greg Pucillo, We appreciate your comment/feedback on the CDIAC Web site. The answer to your question would depend on how much you want to include. A certain amount of energy is spent to transport people to planning meetings, etc., if you want to start there. Equipment usually consumes diesel fuel, but workers have to consume gasoline to get to the site, so you would have to know the mileage and whether each drives a large vehicle or a small one, etc. (also, how much would they be driving if they were not working?) Do you want to include the energy involved in making the steel, fabricating the pieces, etc., and hauling the finished products to the site? Do you want to include the construction of parking facilities? If the building uses cement, then a certain additional factor is the baking of CO₂ off the carbonate rocks to make clinker for the cement (see attached). These factors could be programmed as options for input to a more general program. There are also some people at EPA who may know more details. You may want to look at <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>. The annexes (especially 2 and 3) would contain much information you would find useful. Sincerely, TJ Blasing

Q Dear ladies and gentlemen, For a German company we are creating a global digital atlas which will be distributed for educational and promotional purposes at schools and universities. This atlas will cover all kinds of geocological topics, e.g. maps of climate, topography, soils, hydrology, land cover, population, earth history, etc. Your table datasets "Global, Regional and National Fossil Fuel CO₂ Emissions" found at http://cdiac.ornl.gov/trends/emis/meth_reg.htm are very appealing. At the moment we are evaluating three types of distribution of the new atlas: 1. Distribution as a give-away DVD-ROM without any costs. 2. Distribution as a non-profit DVD which will be sold for less than 10\$. Sales revenues will be completely transferred in charitable projects such as AIDS prevention, deforestation campaigns or projects against genital mutilation. 3. Distribution as a commercial DVD where only parts of sales revenues will be transferred in charitable projects. We would like to ask you the following questions concerning the "Global, Regional and National Fossil Fuel CO₂ Emissions" table dataset: - Are the datasets copyrighted? - Do you give us the right to implement the original datasets, parts of it and/or derived parameters in our global digital atlas? We are not sure if those datasets are in the public domain. - In case of any copyright protection, is it possible to use the datasets free of charge in general or just for a certain type of distribution (see above)? If not, how much are the fees? - In case of any implementation, how should we cite your work in the new digital global atlas? I am looking forward to hear from you. Yours sincerely, Holger Dr. Holger Schaeuble
Geographer and GIS Analyst
Home +49-(0)7071-610949
Mobile +49-(0)163-7329555
www.terra.com
holger.schaeuble@gmx.de
Adress: Beim Herbstenhof 48, 72076 Tübingen, Germany (6/24/07)

A Dear Holger Schaeuble, We appreciate your comment/feedback on the CDIAC Web site. The carbon emissions data you requested are not copyrighted. You may use them freely. Derived parameters should be indicated as such. The appropriate citation is: Marland, G., T.A. Boden, and R. J. Andres. 2007. Global, Regional and National Fossil Fuel CO₂ Emissions. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. Sincerely, T.J. Blasing

Q After visiting the website, you may wish to contribute news releases. Such texts are published free of charge. Barry Prince, News Editor (6/24/07)

A Dear Barry, We appreciate your offer to contribute news item to your service. We may take you up on the offer in the future. In turn, I encourage you to monitor our "What's New" page (<http://cdiac.ornl.gov/whatsnew.html>) for newsworthy items for your clients. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

Q Dear Sir/Madam, You presumably have heard of a recent report that China overtook the US in terms of CO₂ emissions in 2006. See here: http://www.sci-tech-today.com/news/China-No-1-Emitter-of-Carbon-Dioxide/story.xhtml?story_id=11100682NEU <http://www.mnp.nl/en/dossiers/Climatechange/moreinfo/ChinanowndinCC2>

emissionsUSAinsecondpositiohtml I am wondering what sort of credence you give to these statistics. Do you intend to come out with a more thorough set any time soon? Sincerely Yours, Robert Parks (6/22/07)

A Dear Robert, We appreciate your question to the CDIA Web site. We are processing data now and will certainly update our emission time series and post the results. Preliminary monthly data show PRC surpassed the US in May 2007. These results will be released soon in a paper recently submitted. Our estimates are based on published energy statistics by the United Nations and International Energy Agency so we believe credible. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Do you have data/reports on CO₂ emissions from LNG? (6/22/07)

A Dear Wendy al-Mukdad, We appreciate your comment/feedback on the CDIA Web site. I can't find any data of CO₂ emissions from LNG specifically. Much of the LNG is transported as such, but CO₂ accounting will sometimes just call it "natural gas". Sincerely, TJ Blasing

Q I am trying to field a question on CO₂ emissions posed to me by one of my readers. The reader claims to have heard that since the Kyoto Treaty was signed, US CO₂ emissions have gone up 18%, Canadian CO₂ emissions have gone up 27% and European CO₂ emissions have gone up more than 30%. The reader does not provide a source for these percentages and they strike me as unlikely. However, I would like to be able either to verify his statement or, if it is incorrect, to provide the correct percentages. Do you have this information? (6/21/07)

A Dear Andrew, Your reader is not far off. U.S. fossil fuel CO₂ emissions have risen ~20% since 1990. Please see the following URL for details and additional information: <http://cdiac.esd.ornl.gov/trends/emis/annex.htm>. If you need further assistance, please don't hesitate to contact me. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory (865) 241 4842 bodenta@ornl.gov

Q I'm wondering if you have any statistics on the CO₂ emissions created by charcoal grilling. Any pertinent information would be appreciated. (6/18/07)

A Dear Bethany Hopkins, Because charcoal is considered to be "woody biomass" (and also because the amount is very small, compared to other sources) we do not include it in calculations of carbon from fossil fuels. EPA at: <http://epa.gov/climatechange/emissions/download07/07Energy.pdf> doesn't calculate it either. There may be some figures on charcoal sales available somewhere and you could use those to get a maximum figure. TJ We appreciate your comment/feedback on the CDIA Web site. Sincerely,

Q Sir, Please let me know the amount of Carbon Dioxide emitted by one Plant/s of Parthenium in one day or a particular defined period. (6/14/07)

A Dear Samir, I apologize for our delay in responding to your question to the Carbon Dioxide Information Analysis Center (CDIA) web site. I have checked with several colleagues to determine whether any open-top chamber or greenhouse studies have been done to determine amounts of CO₂ respired/fluxes from the invasive weed Parthenium. To date, I have not been able to locate any such studies or experiments. On larger scales, carbon fluxes have been measured on fields where the weed exists but, to my knowledge, not on individual plants. If you care to see ecosystem level carbon fluxes in abandoned agricultural fields or grasslands where the weed grows, I suggest you check the URLs listed below. Sorry I could not be more helpful. If you have heard of such measurements from other sources, please let us know. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory <http://public.ornl.gov/ameriflux/site-select.cfm> <http://www.dar.csiro.au/lai/ozflux>

Q Our company (Locus Technologies) has environmental data management software that we have developed to handle large datasets of groundwater, soil, and air chemical analysis to facilitate the compilation and analysis for our clients' environmentally impacted sites (Chevron, Texaco, Exxon, Honeywell, among others). Recently we were applauded by the Federal EPA when presented our new mapping capability; we tied it to the Superfund database. We believe that this might be useful to your programs as well. Should you be interested, please contact me at (650) 960-1640 at your convenience. Also, you can learn more of our capabilities at www.locustec.com. Sincerely, Jonathan Cowie (6/12/07)

A Dear Jonathan, We appreciate your comment to the CDIA Web site. It sounds like your scientific data management software is quite useful to your clients and, in turn, to EPA. Keep up the good work! Sincerely, Tom Boden

Q Hi CDIA folks. How are things in TN? Ecuador is treating us well. No complaints. I've begun some work with OLADE, and an energy group in Quito. They've asked me to do a method review for them and I'd like to compare their CO₂ emission results

with your's. Could you send me a copy of your methodology(I don't have access to Marland and Rotty(1984) nor Boden et al (1995))? Thanksso much. Take care, London(6/7/07)

A Dear London Losey, Londonr If you send me your mailingaddressI can send you a copy of Marland and Rotty. I'm going to leave it to Tom to send you the NDP thing (Boden et alia 1995). -- TJ We appreciateyour commen/feedback on the CDIAC Web site. Sincerely,

Q Is your centerknowledgableabout the hugh amounts of CO₂ that is emittedfrom gas processingplants-sometimescalled "sweetingplants"? These plantsremove hugh amounts of CO₂ from raw natural gas and vents it to the air. For examplein my home countyof RobertsonCounty, Texas, the gas containsabout 5% CO₂ whichis almostall vented to the air. To get a feel for this amount of CO₂ , our rural county(based on TCEQ permits), spews out some 50MMSCF/D of CO₂ just from the 8 gas plants in the county! Your commentswould be appreciated Of particularinterestis does your organizationaccount for these emissions from these sources? Thanks(6/5/07)

A Dear Lionel Milberger, It IS explicitlyincluded in DoE reports under a categoryincluded "CO₂ emissionsfrom non fuel use of energy fuels" It is NOT explicitlyincluded in our estimatesof monthly fossilfuel CO₂ emissions, which only account for CO₂ realizedfrom combustion It accountsfor about 0.4 percentof the US total anthropogenicCO₂ emissionsrelated to fossil fuels. We appreciateyour commen/feedback on the CDIACWeb site. Sincerely,

Q Your FAQ makes the blunt and unqualifiedstatementthat human breathingdoes not contributeto atmosphericCO₂ This is clearlyerroneous Since the human populationis doublingevery few decadeswhere is the extra CO₂ going? Into new biomass? Where? Then, too, what closed cycle have you ever knownwhich is 100% effectiv? (5/26/07)

A Hi John, We appreciateyour comment on the CDIACFAQ. We need to qualify our human respirationanswer a little better. You really do have to worry about conservationof mass. People do not produceC, they just move it from one place to another i.e. from wheat fields to the atmosphere The bottomline is that morecarbon is being cycled through morepeople, but the net effect is still zero. Thanksagain for the feedback. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am lookingfor data that ranks all causes of greenhousegas emissions, do you have? Thankyou, Gregg Solomon(5/23/07)

A Dear greggsolomon, This dependson what countryyou are interestedin, and whether or not you wish to include natural as well as anthropogeniccauses. The EPA has a nice annualsummaryof anthropogenicources for the USA in its annualinventory report <http://www.epa.gov/climatechange/emissions/usinventoryreport.html> We appreciateyour commen/feedback on the CDIACWeb site. Sincerely,

Q Carbon dioxideis havier (44.0098_g/gmol) than water (18.0152_g/gmol) how can it rise to the higheratmospher? (5/22/07)

A Dear jose luiz monteiro do vale, We appreciateyour commen/feedback on the CDIACWeb site. You are correctthat CO₂ is heavier than water. The heavier CO₂ is mixed with lighterair above through a process knownas "turbulentmixing". Profile measurementsshow that during periods of turbulentmixing CO₂ is well mixed verticallyinto the troposphere As you would expect, during periods of low turbulence(e.g., hot summernights) CO₂ concentrationsare much higher near the groundsurface and drain downslopethrough advection. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I am interestedin long term history of GHG or carbon emissions Do you have data for global GHG or CO₂ emissionsfor 1900, 1950, 2000, ideally by emissionsource type (eg electricitygeneration, mobility/transport, agricultureetc)? Manythanks (5/20/07)

A Dear Ron, Thanksfor your questionto the Carbon Dioxide Information Analysis Center web site. I recommendthe following web sites for CO₂ and GHG emissionestimates, includinglong-term and sectoralestimates. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratoryhttp://cdiac.ornl.gov/trends/emiss/tre_glob.htm http://www.iea.org/textbas/nptoc/CO2_toc.pdf <http://www.afeas.org>

Q I understandthat factory farming increasesglobal warming. Who does factory farming hurt more-the factory farmed animals, or the speciesaffectedby global warming? Will global warmingmean simplythat there will be fewer animals alive, or will there permanentlybe more animals alive and suffering? Warmestregards, Alex (5/13/07)

A Dear Alex, Thanksfor your questionto the CDIACWeb site. Plantsand animals adapt to changingclimate conditions, especiallyover long time periods. Over the next hundredmilleniumwe will see new speciesevolve and see some speciesgo extinct. Whetherthere will be moreor less speciesI do not know. Sincerely, Tom Boden Carbon Dioxide Information Analysis

Q i was wondering if you could settle an argument for me please, i was told that carbon DIOXIDE from car emissions causes global warming and not Carbon MONOXIDE, i was wondering if i could have some proof of this which ever the correct answer from the experts please. thank you very much in advance for your help in this matter. Gary Richardson epsco cyprus (5/11/07)

A Dear Gary, Thanks for your question to the CDIAC Web site. Both CO₂ and CO are emitted from exhaust pipes with carbon monoxide (CO) being more abundant in exhaust. Carbon dioxide (CO₂) is a greenhouse gas (i.e., traps outgoing radiation) and contributes to global warming. Carbon monoxide is not a greenhouse gas, however, CO is quickly oxidized in the atmosphere to form CO₂. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hello, Thank you for the CO₂ trends data - very useful indeed. However, the graphs aren't quite up to the standard I noticed in Norway's graph that the Gas Flaring stats seemed low for an oil producer like Norway. Checking the data, I found that Gas Flaring contributes 21 % of total emissions in Norway! However, the graph suggests a mere 0.5 %. I actually ran the data through R and graphed the variables in question, and I did indeed get the (flawed) graph you have if I do not convert the dots in the source text files (meaning missing values) to NA (not available). (5/10/07)

A Dear Sigve, We appreciate your comment/feedback on the CDIAC Web site. I am glad you were finally able to reproduce our emissions graph once you were able to figure how to handle the missing values (i.e., dots). We agree completely that the Norwegian gas flaring estimates are too low. Our emission estimates reflect the natural gas data reported by Norway to the International Energy Agency in Paris, which in turn are incorporated by the United Nations Energy Statistics Unit (New York). We use the UN energy statistics in our CO₂ emission calculations. We have tried for years without success to settle the problems with the Norwegian gas flaring data with the United Nations. Several years ago we went back to Statistics Norway and the Norwegian Petroleum Directorate but, unfortunately their natural gas data are inconsistent too including the flaring estimates. We continue to remind Statistics Norway of the problem in the hope the IEA and UN data sets will be corrected. I am confident in the future these data will be corrected. Until then we too consider the Norwegian gas flaring estimates unreliable. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q as a percentage of the total amount of CO₂ emitted into the atmosphere each year how much is because of mankind and fossil fuels. (5/9/07)

A Dear dan, We appreciate your comment/feedback on the CDIAC Web site. NATURAL PROCESSES Land and oceans combine to emit about 230 Pg-C (petagrams of carbon, as carbon dioxide) into the atmosphere each year and, on average, they take back about the same amount. Sometimes the atmosphere will experience a net gain, sometimes a net loss, as the process involved vary from year to year. ANTHROPOGENIC PROCESSES Global fossil fuel carbon emissions are about 8 Pg-C per year, which is small compared with natural changes. If you include changes in land use, the number may increase to around 10 Pg-C/yr, but it is still a small percentage of the natural land-ocean exchanges. The difference is that the anthropogenic changes are unidirectional (always adding carbon dioxide to the atmosphere rather than removing it) while the carbon exchanges from natural processes change from year to year, sometimes contributing to an atmospheric gain, sometimes to an atmospheric loss. The natural exchanges kept atmospheric CO₂ levels at around 280 parts per million, plus or minus a little, from year to year. The constantly increasing anthropogenic CO₂ has, over 100 years or more, led to an increase in atmospheric CO₂ of around 100 parts per million, or an increase by about 35% of pre-industrial values. So far, we have been fortunate to have the oceans and the terrestrial biosphere remove about half of this additional carbon input, in addition to their pre-industrial uptake. However, about half the additional input stays in the atmosphere. Sincerely,

Q Have you a discussion paper or graphical presentation of air temperature and CO₂ content in atmosphere plotted against time span from present day back to as far as data or indirect methods of measurement can be relied upon? I am wanting to see what correlation there is and what conclusions have been drawn regarding this. Links to this sort of study would be much appreciated. Thank you Yours Sincerely Geoff Stafford Australia (5/7/07)

A Hi: As Figure SPM-2 of the attached documents shows, CO₂ is not the only driver of climatic change. However, the census is that anthropogenic greenhouse gases are tending to drive the global near-surface atmospheric temperatures upward. In addition to the forcing factors shown in the figure, there are feedback mechanisms (e.g., ice melting) and delay factors (e.g., storage of heat in the oceans). Also, the CO₂ concentration is modulated somewhat by biospheric and oceanic uptakes of carbon from the atmosphere. These vary from year to year. That having been said, here are some links: For global and hemispheric near-surface air temperature go to: <http://www.cru.uea.ac.uk/cru/data/temperature/> For CO₂ concentration the longest "continuous" record is from Mauna Loa Hawaii. It is close to the global average which can be computed from "a number" of stations where "a number" goes up with time as more stations come online. <http://cdiac.ornl.gov/ftp/trends/CO2/maunaloaCO2.TJ>

Q Do you have a calculator for plastic to CO₂, coal to CO₂, methane gas to CO₂, manure to CO₂? (5/7/07)

A Sven, I can't tell where you are writing from and what kind of units you would like, but I can tell you that different places use slightly different coefficients and sometimes these changes slightly through time. The US Environmental Protection Agency uses

units in terragrams of carbon per quadrillion BTU and the values are 25.76 for utility coal in the US and 14.47 for natural gas in the US. (I prefer kg C/terrajoule, but it will depend on whether you are in the US or elsewhere) Obviously pure methane is a bit different. They not give values for plastics or manure. We ought to be able to find a value for plastics but I have never done that calculation. We do have a coefficient that we use for tires. Manure may be tougher because the carbon coefficient per useful energy is going to depend very much on the moisture content. Anyhow, the Intergovernmental Panel on Climate Change maintains what they call the "Emissions Factor Data Base" (EFDB) and you might search in there to see what you can find. Go to the IPCC web site at www.ipcc.ch and search on EFDB. If this does not get you where you want to be, write me directly at marlandgl@ornl.gov and we will see what we can do.

Q I am interested in analyzing per capita CO₂ emissions and am thrilled that you have compiled such an extensive list. However, I wonder why you do not have figures for Ethiopia, Somalia, Lesotho, Liechtenstein, Tuvalu, and a number of islands (that may be included in their governing countries' figures). For the sake of completeness, I would like to be able to include an explanation of these missing statistics in my report. Thank you. (5/7/07)

A Marian, Basically we have a memorandum of understanding with the United Nations statistics office in New York and we use their energy data to estimate CO₂ emissions. So anytime they have energy data, we can estimate CO₂ emissions. There are a number of small pieces that either get left out or are combined with larger pieces. Thus Monaco gets included with France, the Vatican gets included with Italy, etc.

Q Under your Global, Regional & National CO₂ Emissions heading for the United States you write "The United States continues to be the largest single national source of fossil fuel-related CO₂ emissions with emissions of 1580 million metric tons of carbon in 2003. The U.S. has emitted almost 86 billion metric tons of carbon since 1800 from fossil fuel consumption and cement production." Is the emission of 1590 million metric tons just the mass of the carbon in the carbon dioxide? The mass of the carbon dioxide? Or the mass of all of the carbon including the carbon in the CO₂ as well as soot and ashes? It's not really clear. Thank you. (5/2/07)

A It is the mass of carbon in the carbon dioxide. If the truth be told, it also includes any carbon emitted as CO, but we assume that is short lived and will become CO₂ soon anyway.

Q As I geologist, I often wondered about the increased CO₂ contribution attributed to humanity. I have suddenly had the idea about a corresponding increase in phytoplankton in the oceans - has there been studies done on global phytoplankton populations and their link (if any) to increased levels of CO₂ in the atmosphere? (5/2/07)

A The question comes down to the total mass of carbon contained in these reservoirs and there are, of course, estimates. It turns out that the big carbon masses are forests and soils, and both of these have decreased substantially since humans started tinkering with the system. The mass of humans is not very large. The mass of the marine biota is surprisingly small - lots of throughput but not very much stock. I think that our web site has a diagram of the global carbon cycle that gives a diagram with the total stocks and flows of the major reservoirs (look under Frequently asked questions or write me directly and I will help you look for it). I too am a geologist, I think it gives us a different perspective in thinking about changes with time.

Q Humans inhale oxygen and exhale carbon dioxide. Trees take in carbon dioxide and give off oxygen. The birth rate of humans is increasing and the number of trees being cut down is increasing. Should we be concerned about the amount of carbon dioxide being released into the air is more than the amount of oxygen? (4/30/07)

A Dear Joanna, I am not sure I understand your question, but --- if all the known reserves and resources of fossil fuel were burned tomorrow, atmospheric oxygen would decrease by about 1.5 percent. This is equivalent to increasing your elevation by about 150 meters. The main effect would be that marathon records would probably be safer. We appreciate your comment/feedback on the CDIAC Web site. Sincerely,

Q In your FAQs, you indicated that human respiration does not add CO₂ to the atmosphere because it (respiration) merely recycles the carbon contained in the food we eat that has been taken out of the atmosphere by photosynthesis. However, in 1750 there were 790 million people. In 2007 there are 6.2 billion souls on this planet. Surely the increased number of people (read CO₂ producers) must be additive to the total CO₂ content of the atmosphere? (4/29/07)

A You really do have to worry about conservation of mass. People do not produce C, they just move it from one place to another, i.e. from wheat fields to the atmosphere. The bottom line is that more carbon is being cycled through people, but the net effect is still zero. What has happened since 1750 is that we have converted some forests into wheat fields and hence have moved some C from trees to the atmosphere.

Q I used to be able to get up to date Mauna Loa CO₂ info, but all I get now is 2004 info. Why is it so hard to get up to date info. Thanks(4/26/07)

A Dear Bob, We appreciate your comment/feedback on the CDIAC Web site. Regrettably the two people most involved in the Mauna Loa CO₂ record, Drs. Dave Keeling and Tim Whorf, both died suddenly in 2005. Measurements at Mauna Loa by the group at Scripps Institution of Oceanography continue but data have been slow in coming to our data center. In fact, we have not received any data from the group since their deaths. We remain in regular contact with the Scripps group and they assure us updates are coming soon. Once received we will make these data available immediately. In the meantime, I suggest you look at another independent high-quality, in situ atmospheric CO₂ record from Mauna Loa which may be found at <http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/tseries.php?type=mr>. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I was wondering if I could use some of your pictures in a presentation I am giving about global warming. My presentation is this Thursday so I would love to hear back from you! Thank you! (4/24/07)

A Dear Caitlin, You are welcome to use any of the pictures or diagrams from the CDIAC web site in your presentation. When displaying data, please try to acknowledge the original data source (e.g., for the Mauna Loa atmospheric CO₂ record, Source: Dave Keeling data obtained from the CDIAC web site). Good luck with your presentation! Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q How much CO₂ does 1 pound of charcoal (as used in common outdoor grilling) emit? (4/24/07)

A Charcoal is essentially pure carbon so burning simply combines one atom of carbon with two atoms of oxygen to produce one molecule of carbon dioxide. An atom of carbon has an atomic weight of 12, a molecule of carbon dioxide has a molecular weight of 44 (12 + 16 + 16), so 1 pound of carbon yields $44/12 = 3.67$ pounds of carbon dioxide. Cheers, Gregg

Q I'm writing a story on deadline about a local school's attempt to reduce greenhouse gases. Is there a layman's way of translating CO₂ emissions into something tangible, like comparing large swaths of land to Central Park or the state of Rhode Island? I'm working with 82,000 metric tons, or 108.4 million pounds. Best, Michelle Lee (4/23/07)

A Dear Michelle, Thank you for your question to the Carbon Dioxide Information Analysis Center (CDIAC). A release of 82,000 metric tons of CO₂ or 22,343 metric tons of carbon, would surpass the annual releases of all but 38 countries based on 2003 national emission estimates from fossil fuel consumption and cement production (i.e., Romania ranks 38th with ~24K metric tons C and Kuwait ranks 39th with ~21.5K metric tons C). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Hi, I am looking for two maps on global CO₂ emissions, preferably one from the early 1990s and one from late 1990s/early 2000s. I would like to use this for my dissertation (with proper citation of course) in order to show changes in the composition of global carbon dioxide emissions among countries. Where could I find such maps? Thanks so much. Kuheli (4/18/07)

A Dear Kuheli, We appreciate your comment/feedback on the CDIAC Web site. You can find the data you need at: http://cdiac.ornl.gov/trends/emis/em_cont.htm. Sincerely, TJ

Q Hello, I am a student who is doing research on CO₂ emissions in the US. I am trying to find MONTHLY historical data. Karen Freedman from EIA referred me to this site. They only had yearly data, so if you could help me or lead me in the right direction, it would be much appreciated. Sincerely, Soutchita (4/12/07)

A On the CDIAC home page (<http://cdiac.ornl.gov>) look at the list of items on the right side of the page and click on "trace gas emissions". On the next page choose the second bullet "estimates of monthly..." Let us know if this does not yield what you are looking for. Gregg

Q For a Kansas Energy Council background paper, I would like to cite the data from the following file: http://cdiac.ornl.gov/ftp/trends/emis_mon/stateemis/percapbystate.csv. Would you please provide me with the publication date and if applicable the author? Thank you, Trisha Shrum (4/11/07)

A Trisha, Regarding the state data: The on-line data files have been updated through 2001, but the formal publication behind these files is: Blasing, T.J., C. Broniak, and G. Marland, 2005. State-by-state carbon dioxide emissions from fossil fuel use in the United States 1960-2000, *Mitigation and Adaptation Strategies for Global Change* 10: 659-674. Regarding the country data files, the suggested citation is as follows: Marland, G., T.A. Boden, and R. J. Andres, 2006. Global, Regional, and National Fossil Fuel CO₂ Emissions in Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge

Q I have been asking everyone who reports on climate change being caused by humans to answer a question for me. None have even responded, which is why I still believe all of this Human caused crap is just that, crap. When I was in high school 20 years ago, I did a report on the earth's atmosphere. It was nothing special but I did list the main elements found in the atmosphere. As I remember the percents were something like 79% nitrogen, 20% oxygen and the last 1% was made up of several other things. The 1% was broken down to show things like argon, CO₂, methane, etc... I think the CO₂ % was like .035%. My question is what is it now? If the burning of fossil fuel is changing the atmosphere, then I would assume that the % of CO₂ in the atmosphere has changed. If they are saying that a .001% change will throw the earth's climate into chaos, I think they are crazy. Mars has a large % of CO₂ but it's not a hot place. Maybe other things are more important than greenhouse gases. Do you know the percent change in the earth's tilt over the last 100 years? I know Vega will be the north star in 25,000 years, so it has to be changing. The earth's tilt is what causes the seasons on earth I know. Do you know the change in the earth's rotation over that period? I know the earth's rotation is slowed and sped up by the moon's orbit. Do you know how much the earth's distance from the sun has changed in 100 years? I know the Sun will one day grow so large that it engulfs earth completely. Do you know how many comets hit the earth every day? Do you know how many hit the earth 100 years ago? I know the magnetic field that protects earth is not constant. It in fact swaps ever so often. How strong is it compared to 100 years ago? I know that the planets make the sun wobble as they orbit it. I also know that Pluto hasn't made a complete orbit around the sun since you have been alive. Could these have something to do with the planet warming? I just find it hard to believe that humans can effect such a complex thing as earth's climate. (4/10/07)

A Nitrogen does not absorb infrared radiation. Oxygen does not absorb infrared radiation. Argon does not absorb infrared radiation. Carbon dioxide does absorb infrared radiation. The carbon dioxide concentration in the atmosphere has increased from about 280 parts per million in 1860 to about 380 parts per million now - a 36% increase.

Q Is 20 ppm carbon dioxide level high and is it safe to stay in house the gas company has shut all meters down it was in the boiler room in basement not in apartment directly but still in house. I have to children and dogs could u please let me know by phone 540-829-2273 as soon as possible thank u Patti (4/5/07)

A Dear Patti, Thank you for using the CDIAC web site and your question! I am guessing the gas company is concerned about carbon monoxide (CO) and not carbon dioxide (CO₂). Carbon dioxide levels of 20 ppm are nothing to worry about, in fact, ambient levels in the atmosphere are around 380 ppm and CO₂ is not a health hazard until it reaches much higher levels. Carbon monoxide levels of 20 ppm, although not toxic, would be reason for concern and probably cast suspicions about the efficiency and performance of the furnace. I hope the problem is fixed. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q What is the estimated total CO₂ atmospheric input from use of fossil fuels since the beginning of the industrial age, circa 1850? Given estimated rate of clearance, how much of this "extra" CO₂ remains in the atmosphere today? What percentage of the current total estimated atmospheric CO₂ is present as the result of this industrial input? (4/4/07)

A Dear Bruce Selleg, We have records of coal use prior to the beginning of the Industrial Revolution. From 1751-2003 we estimate 305 billion metric tons of carbon were released to the atmosphere from fossil fuel consumption and cement production. We know much of this stays in the atmosphere based on good isotopic records (i.e., C13/C12 and O18/O16 measurements). These isotopic records, along with other data records, support the argument that the unprecedented background levels of CO₂ presently in the atmosphere are due largely to CO₂ releases from fossil fuel burning. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Is it true that ethanol produces less CO₂ than gasoline for the same amount of power generated? If not why is this so often claimed? (4/4/07)

A I believe that this is true, but it is a complex question and not everyone agrees. The thing is that to produce ethanol you have to grow corn (tractor fuel and fertilizer), grind corn (electricity), distill corn liquids (heat), etc. On the other hand you do not have to drill holes, run refineries, etc. By the time you look at the CO₂ emissions from the full life cycle of both processes it is quite a complex analysis. Most people think you come out ahead by making ethanol rather than gasoline, but the gain is smaller than one would wish, and there are a few people who still dispute that you actually come out ahead at all. There is quite a large literature on this topic, including some by us. Cheers, Gregg Marland

Q Hi, I googled the following page <<http://cdiac.esd.ornl.gov/ftp/trends/CO2/maunaloaCO2>> looking for data that would allow me to draw a Keeling Curve for a presentation. However, is the following data available as an excel file? Thank you and best regards, Malte Beckmann Environmental Education Media Project (4/3/07)

A Dear Malte Beckmann, I usually download these as text files, and then read (and save) them in EXCEL. We appreciate your comment/feedback on the CDIAC Web site. Sincerely,

Q Isn't there anyway to vacuum and contain the CO₂ in the atmosphere? I mean, for sure some scientists have invented gadgets to do that. In small packages perhaps. If such do exist, why not develop bigger ones to contain all that CO₂? I know it's gonna cost a lot, but c'mon now. All nations should do something about it, or we will all be extinct in the near future. (4/3/07)

A Sure current technology can let us to capture all the CO₂ we produce. In fact some carbon capturing experiments have already started. But every car equipped with such a device would be like a huge truck and a truck consumes much more fuel than a car. Just imagine our highways are full of trucks and we have to retrofit all our parking lots. Lianhong

Q Please include us, <http://www.bestglobalwarmingarticles.com>, in your links or resource section under global warming sustainability environment climate change or other relevant categories. GlobalWarmingArticles provides facts about the causes, effects and answers to global warming the environment energy conservation climate change and more. Thank you for considering our request for a link to <http://www.bestglobalwarmingarticles.com>. (3/29/07)

A Dear Pani, We appreciate your comment/feedback on the CDIAC Web site. Before we include such a link could you please tell me a little bit more about the sources of your "facts" and articles and your customer base (e.g., scientists, students, general public). Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Is it true that the more carbon dioxide your body expels, the more apt you are to attract mosquitoes? If so, please explain. Thank You... What would be the best way to prevent this? (3/25/07)

A Dear Chris Butchika, I guess if you're active and breathing hard, you're more likely to sweat, which may attract mosquitoes. We appreciate your comment/feedback on the CDIAC Web site. Sincerely, TJ

Q Hi I am looking to get hold of some data that compares the relative annual emissions of CO₂ by natural vs anthropogenic sources (volcanoes, animals, decaying plants etc vs humans). Please can you tell me if you have such data available, or possibly suggest another source I could consult on the web? I appreciate that human activity will have an effect on CO₂ produced 'naturally' (esp from agriculture, deforestation etc) but any pointers would be gratefully received. I hope this is OK - thank you in advance for your time and help. Regards, Nick (3/22/07)

A Sure. The natural component is dominant. Although the anthropogenic component of input to the atmosphere is small for any given year, it has accumulated over time so that the earth-atmosphere system is continually readjusting to some new equilibrium that would be achieved after the atmospheric value remained constant for several decades. Try the following web site, the data are old, but will give you a general idea. http://cdiacornl.gov/images/carbon_cycle.gif TJ

Q Why are there no figures after Dec 2004 on the samplings concentrations page - <http://cdiacornl.gov/ftp/trends/CO2/maunaloaCO2>. Thanks and regards (3/22/07)

A Dear Tony, Regrettably Dr. Dave Keeling died in 2005. Dave was a scientific pioneer who initiated the atmospheric CO₂ measurements at Mauna Loa. Measurements continue today at Mauna Loa but Dave's former group is struggling to keep up with data processing and submission to our center. We remain in regular contact with the group and hopefully updates will be available soon. Thanks for your comment/question to the CDIAC Web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q If a gallon of gasoline yields 172 cubic ft of pure CO₂ gas (www.icbe.com, carbon for kids)... how large a volume of air will this effectively "mix" with? 1. If atmospheric CO₂ is increasing at roughly 2 ppmv, then is the air volume $172 \times 1,000,000 / 2$? or 86 million cubic feet? Assuming the air has 380 ppm to start with and we are adding 2 more this year? Thanks in advance for your help. Trying to put together a powerpoint for junior high students. Joe Witte (3/16/07)

A Answer: First of all, I'm not sure I fully understand your question, but let me provide some insight if I can. (1) ICBE is a bank, not a scientific organization. I would suggest the EPA site for the kiddies: <http://www.epa.gov/climatechange/kids/> (2) Combusting a gallon of gasoline produces on the order of 9 kg of CO₂; this is about 0.3×10^{-12} of the annual total of 27.5×10^{12} kg of CO₂ from global fossil fuel combustion each year. This global total adds about 3.5 parts per million (3.5×10^{-6}) by volume of CO₂ to the atmosphere (3) about half of this stays in the atmosphere, the rest is taken up by the oceans and the terrestrial biosphere, leaving about 1.7 ppmv increase per year as atmospheric CO₂. Lately the fraction has increased to a bit more than half, leaving about 2 ppmv more in the air each year, as you noted. (4) as I noted above, combusting one gallon of gasoline adds about 0.3×10^{-12} of the total, so that gallon would contribute $(3.5 \times 10^{-6}) \times (0.3 \times 10^{-12}) =$ about one part in 10^{18} . This is called one part per quintillion in the USA; in other parts of the world, they call it something else; see: http://www.uni-bonn.de/~manfeaz/numbers_names.php On average, half of that would be taken up by the oceans or terrestrial biosphere, so that about 0.5 parts per quintillion would be the net result of combusting a gallon of gasoline. Because as I noted earlier, that airborne fraction seems to be increasing lately, maybe 0.6 parts per quintillion would be a better number. If the atmosphere were only 86 million cubic feet, that would be (442 feet) cubed, which is a pretty small atmosphere. Finally, why are you

using "feet" instead of meters? TJ

Q Would you have a great pie chart showing CO₂ emissions by country? most recent data available? thanks (3/13/07)

A Dear Sharon, I don't have a pie chart but the data needed for the chart may be found at <http://cdiac.ornl.gov/trends/emissions/top2003.tot> We appreciate your comment/feedback on the CDIA Web site. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Dear sir/madam, We are making a TV documentary for TV Asahi, Japan about global warming and wish to make a graph using some of your data on CO₂ concentrations since 400,000 years ago up to present. We wish to know if we can have a permission to use them for this purpose. When we broadcast we credit CDIA/ORNL/DOE (in Japanese) on screen. If we could have your reply at your earliest convenience it would be highly appreciated. Thank you for your kind consideration. Kind regards, Kawabe Tomohiro Advan Bridge Inc. Higashigonai 60-1-301, Oiwa, Toyohashi #12288 Aichi, Japan 441-3142 Tel. & FAX: +81-532-41-8719 & #12288 Mobile +81-90-9909-0477 & #12288 e-mail: kawabe@advanbridge.com (3/13/07)

A Dear Kawabe, You have my permission to use the long-term atmospheric CO₂ concentration records derived from ice cores in your broadcast. Thank you for your efforts to acknowledge our data center as the data source. I think the best citation depending on which ice core record you choose would follow this general model. Primary investigator et al./CDIA For example, if you are using the Vostok CO₂ ice core record I suggest the following credit: Barnola et al./CDIA I hope the broadcast goes well. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q <http://video.google.com/videoplay?docid=900556679281149763&q=the+great+global+warming+swindle> Dear sir / Madam Above is a link that will bring you to a documentary on global warming that has shook up people in Europe. It is probably the most pivotal video documentary on the subject. What do you think? I would love to get your opinion. Conor O'Riordan 61 Beechwood Park, Pollerton, Carlow, Ireland Conor O'Riordan (3/11/07)

A Dear Connor, I finally got around to watching the video. The production and photography were very professional. The documentary was carefully worded/edited to capture the full breadth of the skeptical view on global warming (i.e., solar activity, importance of water vapor, greater surface warming than tropospheric warming, modeling uncertainty, etc.). Many of those interviewed are capable, competent people who articulate their view quite well. Personally, I believe solar activity, natural climate variability AND greenhouse gases are all contributing to the warming trends observed over the past few decades. The documentary not surprisingly failed to mention several key points. For example, all climate and biogeochemical models include water vapor or that model runs with only changes in solar activity/sunspots cannot reproduce the observed climate patterns of late (i.e. only when the model includes a greenhouse gas induced forcing can we reconstruct recent climate patterns). None of those interviewed argued that CO₂ was not rising nor that human consumption of fossil fuels was not a big part of the reason for the rise. Thanks for your comment. Sincerely, Tom Boden

Q Could you please send me information about a "Carbon Footprint" and any statistics you could provide regarding the amount of carbon Dioxide use by the US? I appreciate your time and help. Cordially Mark Abromaitis (3/8/07)

A Dear Mark, We appreciate your comment/feedback on the CDIA web site. I suggest you visit the two web sites listed below to learn more about "carbon footprint" and US releases of CO₂ from fossil fuel use and cement production. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory bodenta@ornl.gov <http://www.carbonfootprint.com> http://cdiac.ornl.gov/trends/emissions/tre_usa.htm

Q Hello, Do you know how I would learn approximately how much CO₂ is produced from the burning of various fossil fuels to produce electricity? Ideally, the numbers I am looking for are the tons (or metric tons) of CO₂ released to produce 1 MWh of electricity at: 1) a typical U.S. pulverized coal plant 2) a U.S. IGCC coal plant 3) a typical U.S. simple cycle natural gas plant 4) a U.S. combined cycle natural gas plant. Ideally, it would be good to be able to cite a source within the department of energy for these numbers. Thanks very much for your help. (3/7/07)

A Dear Joshua, Thank you for your inquiry to the CDIA Web site. Two data sources come to mind quickly. One is the International Energy Agency in Paris. IEA publishes an annual report entitled "CO₂ Emissions from Fuel Combustion". http://www.iea.org/textbase/nptoc/co2_toc.pdf Note one of the sections in the publication - CO₂ Emissions per kWh from Electricity and Heat Generation. The second source is the U.S. Department of Energy's Energy Information Administration (EIA). They too publish an annual report of U.S. CO₂ emissions by sector including the electric power sector. <http://www.eia.doe.gov/oiaf/1605/gg04rpt/carbon.html> Hope this helps. Sincerely, Tom Boden Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q Do you have state by state CO₂ emissions data for years beyond 2001? (3/5/07)

A Question Do you have state by state CO₂ emissions data for years beyond 2001? Answer No, but Perry Lindstrom does, thru 2003. Perry.Lindstrom@eia.doe.gov TJ

Q I read through the FAQ section and found that you explain the contribution of carbon emissions to the growing atmospheric CO₂. I'm wondering specifically how much has industry produced carbon dioxide emissions increased in the last century? Has it more than doubled? Quadrupled? Thank you, Christy (3/1/07)

A Hi Christina I received this e-mail twice, once from you and once from our FAQ process, which actually works (surprise). The CO₂ is not all from industry motor fuel is probably the biggest CO₂ producer in the USA these days. Like many others, I heat my home with natural gas, so us individuals are directly responsible for some fossil CO₂ also. Finally I don't know if you would count electricity generation as "Industry." Let me give you 3 sources of information and you can pick and chose. We have USA and state-by-state data available, but they do not go back very far so I don't think that is what you want http://cdiacornl.gov/trends/emis_mon/stateemis/emis_state.htm and http://cdiacornl.gov/trends/emis_mon/emis_mon_CO2.html EPA is probably just about to come out with their 2007 version of their "Inventory" document on USA greenhouse gas emissions-- Everything you would need back to 1990 or so. Doesn't answer your question but might be worth a look. It is an excellent breakdown of CO₂ emissions by consumer activity (including industry). <http://yosemite.epa.gov/oar/globalwarmingnsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html> Probably what would best serve your purposes is the global CO₂ emissions data base which gives fossil fuel combustion by fuel type (coal, oil, gas) and goes back a "long" time, where "long" varies from country to country. These data are production based estimates and do not differentiate between coal used for heating homes and coal used for making steel. It is, however, the standard fossil fuel data base. http://cdiacornl.gov/trends/emis/em_cont.html Because that link is not working this morning you may not be able to bring it up right away. No problem. There will be 3 bullets on the page that says the web can't find it. If that happens go to the 3rd bullet and click "products and services" and then click on "trace gas emissions" and it should be the first one on the list. There used to be long arguments about how much fossil fuel CO₂ could be removed from the atmosphere by the oceans and the terrestrial biosphere. Some thought that because the oceans and terrestrial biosphere had been removing tremendous amounts of CO₂ generated by termites and other decomposers that a relatively small increase from fossil fuels could also be removed. Others thought that atmospheric CO₂ was in a more delicate balance and a small upset in a constant direction (small addition every year) would accumulate to produce an increase. While the oceans and terrestrial biosphere have taken up around half of the additional fossil carbon, the other half has accumulated causing an atmospheric CO₂ increase from the preindustrial value of 280 ppmv to the present concentration of around 380 ppmv. Cheers and good luck with your book. TJ

Q Hello, Reference your link (http://cdiacornl.gov/images/carbon_cycle.gif) regarding where CO₂ comes from, am I interpreting it correctly to say that human-based contribution is 6.2 of 775 global emissions? I've been trying to find out and understand how much CO₂ is human-based global emissions and what's the global figure, further what's the percentage of human contribution? I'm keen for recycling & conserving but equally I'd like to understand if we are in fact purely a minor contributor to the global CO₂ emissions as it seems some critics say. (2/26/07)

A Dear Jeff, Thank you for your question to the CDIA Web site. Please pardon my delay in responding. You are not quite right in your interpretation of the carbon cycle diagram on our web site. The diagram shows both pools of carbon (e.g., 750 billion tons of C reside in the atmosphere) and estimates of annual fluxes into and out of various components (e.g., oceans, atmosphere, terrestrial biosphere). The key points are 1) the pool of CO₂ in the atmosphere is growing irrefutably and is the highest it has been for the past million years, 2) releases of CO₂ from fossil fuel burning are growing (now ~ 8 billion tons of carbon instead of the 6.2 shown on the diagram), and 3) the rise in atmospheric CO₂ is due to fossil fuel burning. FYI, humans also contribute to the release of CO₂ through land-use practices (e.g., converting forests to agricultural lands), however, this source of anthropogenic CO₂ has remained relatively constant for the past decades (i.e., deforestation in the tropics has been offset by reforestation in temperate regions). If you need pointers to the wealth of data that support points 1-3 above, please let me know. Sincerely, Tom Boden
Carbon Dioxide Information Analysis Center Oak Ridge National Laboratory

Q I've read that infrared radiation from Earth is most intense at wavelengths close to the principal absorption band of the CO₂ spectrum (13 to 17 microns). CO₂ composes only 0.035% of Earth's atmosphere relative to 1+% for water vapor. Does the 13- to 17- micron absorption property of CO₂ help make it more significant as a greenhouse gas than its 0.035% concentration would lead one to believe? How do CO₂ and water vapor compare as greenhouse gas absorbers of infrared radiation? (2/22/07)

A BACKGROUND CO₂ and water vapor are both plentiful enough, and strong enough absorbers to cause what we call radiative saturation. The atmosphere is opaque in some CO₂ bands and in some H₂O bands. Analogy: Can you see the next room better looking thru a wall made of plywood or a wall made of concrete blocks? ANSWERS The answer to your first question is "somewhat." Water vapor has a weak overlapping absorption band out in the same wavelengths. As I recall, water vapor is more effective than CO₂ as a greenhouse gas, but there is a common misunderstanding here. Minimum temperatures will be lower when the relative humidity (or, for a given daytime temperature the absolute humidity) is lower, but this is mostly due to dew, so to speak. When the relative humidity is high, dew is more likely to form, and the heat of water-vapor condensation is released, greatly retarding the decrease in temperature due to diurnal changes in the radiation balance. Hope this helps. TJ

Q | Dear CDIAC- I am trying to calculate the U.S. average CO₂ emissions per unit of natural gas use. I thus need to find statistics (for the most recent few years) on the percentage of total natural gas used in the U.S. that is combusted for any use (e.g. heat, cooking, lighting, etc.) and hence directly leads to CO₂ emissions versus the percentage that is used in other ways (such as a feedstock for chemical and product manufacture) and hence does not directly lead to CO₂ emissions. Would you have such numbers or know where I might find them? Many thanks, Dr. Keith Ferguson, Staff lawyer Sierra Legal Defence Fund (2/8/07)

A | Some carbon is combusted to CO₂ as fuel. Some is used for non-fuel products that quickly oxidize to CO₂. Some is stored in plastics, etc. If I understand your question, you need to go to <http://epa.gov/climatechange/emissions/usinventoryreport.html> and download Chapter 3 <http://epa.gov/climatechange/emissions/download/06/06Energy.pdf> and go to section 3.2. There are also a lot of references given beginning around the bottom of page 11-5 of (Ch 11) of the completed document. TJ

Q | Since you removed the "TOP TEN" page, I can't find the Global, National and Regional CO₂ emissions pages. There were other links on the top ten page which I found useful. Is that page still available somewhere else? And can you direct me to the emissions data? (2/8/07)

A | Try: http://cdiacornl.gov/trends/emis/tre_coun.htm Or http://cdiacornl.gov/trends/emis/em_cont.htm If these links don't work, the complaint department is: Fred Baes <bae@ornl.gov>. If the links work, but that was not what you wanted, the complaint dept. is back to me. TJ

Q | >> I understand from a previous question that whether or not atmospheric >> water vapor is increasing or decreasing can't be determined, however >> even if water vapor concentrations were assumed to be constant >> shouldn't water vapor still be factored into the total greenhouse gas >> effect? I have heard that water vapor alone is responsible for 95% of >> the total greenhouse effect. If this is done, what is the percentage >> of >>> impact of anthropogenic CO₂ on the total greenhouse effect? >>> -Jim Cook (1/26/07)

A | Jim, I think the key here is that man-made additions of CO₂ to the atmosphere act as a perturbation or "forcing" that has extremely long-lasting effects. While other GHGs have higher global warming potentials (GWPs) (degree of forcing on a per molecule basis), it is the total forcing that counts for any of these gases. Because we are pumping >7 GTonnes per year of carbon into the atmosphere, this is easily the largest man-made forcing, estimated to be about 1.5 W/m² since 1750 by IPCC. 1.5 W/m² is actually quite significant. This type of ongoing/growing change will act to shift the earth-atmosphere system out of radiative balance. A generally accepted estimate of the system's "climate sensitivity" is about 0.75 deg C per Wm⁻² (worked out using many types of models over the years by many investigators). Also see, from the IPCC chapter: http://www.grida.no/climate/ipcc_tar/wg1/fig6-6.htm regarding the forcing due to various factors. Also, here is the link to Dr. Jim Hansen's page at the Goddard Institute for Space Studies. The page has many links to pdfs and ppt files of various articles and presentations. I would refer you to the Dec 2005 talk that got him in "trouble" with the Bush administration (it was in the news a lot) for a particularly extensive discussion of radiative balance: <http://www.columbia.edu/~jeh1/>. As far as water vapor goes, all climate modelers understand that water vapor is by far the biggest greenhouse gas. It's just that near as they can tell, it has a pretty constant radiative forcing. In simple terms it relates to what goes up must come down. More water vapor in the atmosphere (thought to likely be resulting due to warming and thus more evaporation) may not be able to be maintained because of the constant evaporation/condensation/precipitation loop, i.e., the water cycle. Good luck with your research into these questions. Dale Kaiser. On Friday 26 January 2007 14:24, you wrote > Sorry, but I've looked at that site before, I just checked it again > make sure it was the same one. The IPCC does not address the issue of > water vapor as a greenhouse gas, or its effect on global warming > Isn't it odd, that if indeed water vapor is responsible for 95% of the > global warming effect, that the IPCC does not address it? Even if > anthropogenic CO₂ is responsible for a 50% increase in CO₂, (which is > greater than even the most liberal estimate) but CO₂ and all other > greenhouse gases together are only responsible for 5% of the total > greenhouse effect, how much real effect is anthropogenic CO₂ having on > climate change? Shouldn't the numbers include water vapor? Have you > looked at the site > http://www.geocraft.com/WVFossils/greenhouse_data.html? Very > informative and objective look at the numbers, which, among other things > would make me look at nitrous oxide as a much more troublesome > greenhouse gas than CO₂. > Jim Cook >> -----Original Message----- > From: Dale Kaiser

[mailto:kaiserdp@ornl.gov] > Sent Friday, January 26, 2007 11:37 AM > To: Cook, James > Cc: kaiserdp@ornl.gov > Subject: Re: Factoring in the effect of Water vapor >> Jim, >> I don't have figures off the top of my head. The link below is a lot to > read, > but I'm afraid the IPCC is the best place to go to get estimates of all > the > different radiative forcings (like by CO₂) that can affect the radiative >> balance of the earth-atmosphere system >> http://www.grida.no/climate/ipcc_tar/wg1/212.htm