THE CO_2 DIET FOR A GREENHOUSE PLANET: ASSESSING INDIVIDUAL ACTIONS FOR SLOWING GLOBAL WARMING

John DeCicco, Jim Cook, Dorene Bolze, and Jan Beyea
National Audubon Society

INTRODUCTION

Because of uncontrolled population growth and a short-sighted choice of technologies, humankind is emitting enormous quantities of greenhouse gases. Reducing emissions of these gases which can disrupt the Earth's climate will require action by individuals as well as by governments and industries. Most energy use currently entails carbon dioxide (CO_2) emissions; increasing energy efficiency can therefore address a major portion of the emissions. Reducing emissions of other greenhouse gases, such as halocarbons, is also necessary. Following such a "low-CO_2 diet" will require lifestyle changes and prudent consumption choices by individuals. This poster and the report [1] on which it is based focus on the activities related to greenhouse gas emissions in the U.S. over which individuals have some control.

The greenhouse effect and the need for a substantial curtailment of fossil fuel use is amply documented elsewhere ([2], [3], other references in [1]). In Figure 1, the upper curve shows past and projected atmospheric CO_2 levels as a percent increase over the pre-industrial level (290 ppm [2], so that 100% is a doubled concentration of 580 ppm). A climate-stabilization scenario, implying a cumulative global emissions budget of 10^{12} tons of fossil-source CO_2 through year 2100 [3], follows the lower curve. Meeting this budget will require a firm belt-tightening on fossil fuel consumption by nations like

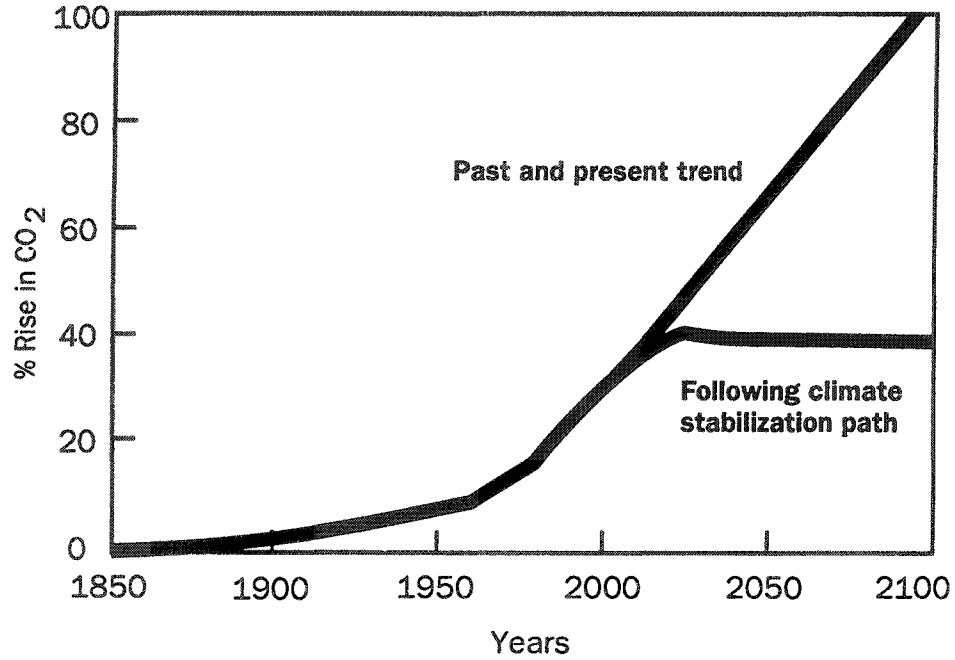

Figure 1. Atmospheric Carbon Dioxide Levels from 1850 to 2100, Given as Percent Rise from the Pre-Industrial Level (290 ppm). The fork in the graph shows the choice between the current greenhouse gas emission trend versus following the CO_2 Diet.

the United States. Making an analogy to nutritional calorie counting, we propose a *CO_2 Diet*, having an initial goal of reducing emissions by 20% in ten years (an average of 2% per year). Subsequently, even greater cuts in greenhouse gas emissions will be needed, with reductions on the order of 75% by the middle of the next century.

To provide a context for emissions by individuals, we estimated U.S. greenhouse gas emissions by economic sector. Annual CO_2 emissions amount to 5.5 billion tons, breaking down as 35% industrial, 33% transportational, 18% residential, and 14% commercial. The next largest contributors to global warming are halocarbons, which we estimate to have an impact equivalent to another 1.4 billion tons of CO_2. The total is nearly 7 billion tons, or 55,000 pounds per capita, of annual CO_2-equivalent emissions. Individuals have the most control over emissions from residences and personal transportation, which amount to 18,000 pounds of CO_2 equivalence per capita (about one-third of the total).

Aggregate statistics do not reveal an individual's emissions--these are best estimated by an individualized analysis. We developed a worksheet (shown here in Table 1) for assessing greenhouse gas emissions by individuals or households. Full instructions for this greenhouse emissions "audit" (similar to an energy audit) are provided in [1]. Also provided are estimates of the emissions reductions associated with energy conservation and other appropriate measures that individuals might take to reach their CO_2 "dietary" goals.

We calculated a sample *Diet for a Greenhouse Planet* based on an author's household, assuming the use of measures that individuals can take at their own discretion, without new public policies for lowering greenhouse gas emissions. This exercise suggested that we would fall short of the goal of a 20% reduction in ten years. We estimate that cuts in greenhouse gas emissions due to individual actions must be met on a 3-for-1 basis by cuts achieved through actions by government and industry. This will involve policy changes to promote efficient and renewable energy technologies, a commitment to make available products and services compatible with very low fossil fuel use, as well as restrictions on halocarbons and other substances that adversely impact climate. Such actions will certainly be needed to achieve the ongoing emissions cuts required for climate stabilization over the decades to come.

The *CO_2 Diet for a Greenhouse Planet* is a useful motivational tool for organizations wishing to promote energy efficiency for its environmental as well as economic benefits. The worksheet highlights the importance of energy-efficiency in reducing greenhouse gas emissions. By quantifying the reductions of greenhouse gas emissions possible at the personal level, it is reaffirmed that, while discretionary measures undertaken by individuals are important, they can only go so far towards limiting global warming. Further discussion and recommendations for policy measures needed to support and complement the *CO_2 Diet* are given in [1].

REFERENCES

1. DeCicco, J., J. Cook, D. Bolze, and J. Beyea. The CO_2 diet for a greenhouse planet: a citizen's guide to slowing global warming. Audubon Policy Report No. 1, National Audubon Society, New York, NY, June 1990.
2. Schneider, S.H. The changing climate. *Scientific American* 261(3):70-79, September 1989.
3. Krause, F., W. Bach, and J. Koomey. Energy policy in the greenhouse, Volume I: From warming fate to warming limit: benchmarks for a global climate convention. International Project for Sustainable Energy Paths, El Cerrito, CA, September 1989.

Table 1. Worksheet for the CO_2 Diet for a Greenhouse Planet (A greenhouse gas emissions audit.)

Consumption or activity	Your use (units per year)	CO_2 factor ($lbCO_2$/unit)	Annual emissions ($lbCO_2$ equiv)
RESIDENTIAL UTILITIES			
Electricity	_____ kWh	1.5 lb/kWh	_____
Oil	_____ gallons	22 lb/gal	_____
Natural gas	_____ therms	11 lb/therm	_____
Propane or bottled gas	_____ gallons	20 lb/gal	_____
TRANSPORTATION			
Automobile fuel use	_____ gallons	22 lb/gal	_____
Other motor fuel use	_____ gallons	22 lb/gal	_____
Air travel	_____ miles	0.9 lb/mile	_____
Bus, urban	_____ miles	0.7 lb/mile	_____
Bus, intercity	_____ miles	0.2 lb/mile	_____
Railway or subway	_____ miles	0.6 lb/mile	_____
Taxi or limousine	_____ miles	1.5 lb/mile	_____
HOUSEHOLD WASTE			
Trash (anything discarded)	_____ pounds	3 lb/lb	_____
Recycled items	_____ pounds	2 lb/lb	_____
HALOCARBON PRODUCTS			
Refrigerators and freezers	_____ (number)	830 lb each	_____
Automobile air conditioners	_____ (number)	4800 lb each	_____
Other halocarbon products (see report for equivalences)			_____

TOTAL ANNUAL GREENHOUSE GAS EMISSIONS (pounds of CO_2 equivalent): _____