



# A New Global Warming Strategy

How Environmentalists are Overlooking  
Vegetarianism as the Most Effective Tool  
Against Climate Change in Our Lifetimes

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# A New Global Warming Strategy: How Environmentalists are Overlooking Vegetarianism as the Most Effective Tool Against Climate Change in Our Lifetimes

## SUMMARY

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Global warming poses one of the most serious threats to the global environment ever faced in human history. Yet by focusing entirely on carbon dioxide emissions, major environmental organizations have failed to account for published data showing that other gases are the main culprits behind the global warming we see today. As a result, they are neglecting what might be the most effective strategy for reducing global warming in our lifetimes: advocating a vegetarian diet.

### Global Warming and Carbon Dioxide

The environmental community rightly recognizes global warming as one of the gravest threats to the planet. Global temperatures are already higher than they've ever been in at least the past millennium,<sup>1</sup> and the increase is accelerating even faster than scientists had predicted.<sup>2</sup> The expected consequences include coastal flooding, increases in extreme weather, spreading disease, and mass extinctions.

Unfortunately, the environmental community has focused its efforts almost exclusively on abating carbon dioxide (CO<sub>2</sub>) emissions. Domestic legislative efforts concentrate on raising fuel economy standards, capping CO<sub>2</sub> emissions from power plants, and investing in alternative energy sources. Recommendations to consumers also focus on CO<sub>2</sub>: buy fuel-efficient cars and appliances, and minimize their use.<sup>3,4</sup>

This is a serious miscalculation. Data published by Dr. James Hansen and others<sup>5</sup> show that CO<sub>2</sub> emissions are not the main cause of observed atmospheric warming. Though this may sound like the work of global warming skeptics, it isn't: Hansen is Director of NASA's Goddard Institute for Space Studies who has been called "a grandfather of the global warming theory."<sup>6</sup> He is a longtime supporter of action against global warming, cited by Al Gore<sup>7</sup> and often quoted by environmental organizations, who has argued against skeptics for subverting the scientific

process.<sup>8</sup> His results are generally accepted by global warming experts, including bigwigs like Dr. James McCarthy, co-chair of the International Panel on Climate Change's Working Group II.<sup>9</sup>

The focus solely on CO<sub>2</sub> is fueled in part by misconceptions. It's true that human activity produces vastly more CO<sub>2</sub> than all other greenhouse gases put together. However, this does not mean it is responsible for most of the

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earth's warming. Many other greenhouse gases trap heat far more powerfully than CO<sub>2</sub>, some of them tens of thousands of times more powerfully.<sup>10</sup> When taking into account various gases' global warming potential—defined as the amount of actual warming a gas will produce over the next one hundred years—it turns out that gases other than CO<sub>2</sub> make up most of the global warming problem.<sup>11</sup>

Even this overstates the effect of CO<sub>2</sub>, because the primary sources of these emissions—cars and power plants—also produce aerosols. Aerosols actually have a cooling effect on global temperatures, and the magnitude of this cooling approximately cancels out the warming effect of CO<sub>2</sub>.<sup>12</sup> The surprising result is that sources of CO<sub>2</sub> emissions are having roughly zero effect on global temperatures in the near-term!<sup>13</sup>

This result is not widely known in the

environmental community, due to a fear that polluting industries will use it to excuse their greenhouse gas emissions. For example, the Union of Concerned Scientists had the data reviewed by other climate experts, who affirmed Hansen's conclusions.<sup>14</sup> However, the organization also cited climate contrarians' misuse of the data to argue against curbs in CO<sub>2</sub>.<sup>15</sup> This contrarian spin cannot be justified.

While CO<sub>2</sub> may have little influence in the near-term, reductions remains critical for containing climate change in the long run. Aerosols are short-lived, settling out of the air after a few months, while CO<sub>2</sub> continues to heat the atmosphere for decades to centuries. Moreover, we cannot assume that aerosol emissions will keep pace with increases in CO<sub>2</sub> emissions.<sup>16</sup> If we fail start dealing with CO<sub>2</sub> today, it will be too late down the road when the emissions catch up with us.

Nevertheless, the fact remains that sources of non-CO<sub>2</sub> greenhouse gases are responsible for virtually all the global warming we're seeing, and all the global warming we are going to see for the next fifty years. If we wish to curb global warming over the coming half century, we must look at strategies to address non-CO<sub>2</sub> emissions. The strategy with the most impact is vegetarianism.

## **Methane and Vegetarianism**

By far the most important non-CO<sub>2</sub> greenhouse gas is methane, and the number one source of methane worldwide is animal agriculture.<sup>17</sup>

Methane is responsible for nearly as much global warming as all other non-CO<sub>2</sub> greenhouse gases put together.<sup>18</sup> Methane is 21 times more powerful a greenhouse gas than CO<sub>2</sub>.<sup>19</sup> While atmospheric concentrations of CO<sub>2</sub> have risen by about 31% since pre-industrial times, methane concentrations have more than doubled.<sup>20</sup> Whereas human sources of CO<sub>2</sub> amount to just 3% of natural emissions, human sources produce one and a half times as much methane as all

natural sources.<sup>21</sup> In fact, the effect of our methane emissions may be compounded as methane-induced warming in turn stimulates microbial decay of organic matter in wetlands—the primary natural source of methane.<sup>22</sup>

With methane emissions causing nearly half of the planet's human-induced warming, methane reduction must be a priority. Methane is produced by a number of sources, including coal mining and landfills—but the number one source worldwide is animal agriculture.<sup>23</sup> Animal agriculture produces more than 100 million tons of methane a year.<sup>24</sup> And this source is on the rise: global meat consumption has increased

fivefold in the past fifty years, and shows little sign of abating.<sup>25</sup> About 85% of this methane is produced in the digestive processes of livestock,<sup>26</sup> and while a single cow releases a relatively small amount of methane,<sup>27</sup> the collective

effect on the environment of the hundreds of millions of livestock animals worldwide is enormous. An additional 15% of animal agricultural methane emissions are released from the massive “lagoons” used to store untreated farm animal waste,<sup>28</sup> and already a target of environmentalists' for their role as the number one source of water pollution in the U.S.<sup>29</sup>

The conclusion is simple: arguably the best way to reduce global warming in our lifetimes is to reduce or eliminate our consumption of animal products. Simply by going vegetarian (or, strictly speaking, vegan),<sup>30,31,32</sup> we can eliminate one of the major sources of emissions of methane, the greenhouse gas responsible for almost half of the global warming impacting the planet today.

## **Advantages of Vegetarianism over CO<sub>2</sub> Reduction**

In addition to having the advantage of immediately reducing global warming, a shift away from methane-emitting food sources is much easier than cutting carbon dioxide.

First, there is no limit to reductions in this source

of greenhouse gas that can be achieved through vegetarian diet. In principle, even 100% reduction could be achieved with little negative impact. In contrast, similar cuts in carbon dioxide are impossible without devastating effects on the economy. Even the most ambitious carbon dioxide reduction strategies fall short of cutting emissions by half.

Second, shifts in diet lower greenhouse gas emissions much more quickly than shifts away from the fossil fuel burning technologies that emit carbon dioxide. The turnover rate for most ruminant farm animals is one or two years, so that decreases in meat consumption would result in almost immediate drops in methane emissions. The turnover rate for cars and power plants, on the other hand, can be decades. Even if cheap, zero-emission fuel sources were available today, they would take many years to build and slowly replace the massive infrastructure our economy depends upon today.

Similarly, unlike carbon dioxide which can remain in the air for more than a century, methane cycles out of the atmosphere in just eight years, so that lower methane emissions quickly translate to cooling of the earth.

Third, efforts to cut carbon dioxide involve fighting powerful and wealthy business interests like the auto and oil industries. Environmental groups have been lobbying for years to make fuel-efficient SUVs available or phase out power plants that don't meet modern environmental standards without success. At the same time, vegetarian foods are readily available, and cuts in agricultural methane emissions are achievable at every meal.

Also, polls show that concern about global warming is widespread, and environmental activists often feel helpless to do anything about it. Unless they happen to be buying a car or

major appliance, most people wanting to make a difference are given little to do aside from writing their legislators and turning off their lights. Reducing or eliminating meat consumption is something concerned citizens can do every day to help the planet.

Finally, it is worth noting that reductions in this source of greenhouse gas have many beneficial side effects for the environment. Less methane results in less tropospheric ozone, a pollutant damaging to human health and agriculture.<sup>33</sup> Moreover, the same factory farms responsible for these methane emissions also use up most of the country's water supply, and denude most of its

wilderness for rangeland and growing feed. Creating rangeland to feed western nations' growing appetite for meat has been a major source of deforestation and desertification in third world countries. Factory farm waste lagoons are a leading source of

water pollution in the U.S. Indeed, because of animal agriculture's high demand for fossil fuels, the average American diet is far more CO<sub>2</sub>-polluting than a plant-based one.<sup>34</sup>

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## Recommendations

- Organizations should consider making advocating vegetarianism a major part of their global warming campaigns. At a minimum, environmental advocates should mention vegetarianism in any information about actions individuals can take to address global warming.
- Government policy should encourage vegetarian diets. Possible mechanisms include an environmental tax on meat similar to one already recommended on gasoline, a shift in farm subsidies to encourage plant agriculture over animal agriculture, or an increased emphasis on vegetarian foods in government-run programs like the school lunch program or food stamps.

## Endnotes

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<sup>1</sup> Mann, Michael E. et al., “Northern Hemisphere Temperatures During the past Millennium: Inferences, Uncertainties, and Limitations”, *Geophysical Research Letters*, Vol. 26, No. 6, 1999, p. 759-762, [http://www.ngdc.noaa.gov/paleo/pubs/mann\\_99.html](http://www.ngdc.noaa.gov/paleo/pubs/mann_99.html).

<sup>2</sup> “Global warming may be accelerating,” *USA Today*, 17 Mar. 2000, <http://www.usatoday.com/weather/news/2000/wgblwrn.htm>.

<sup>3</sup> Some examples: U.S. PIRG’s global warming site (<http://uspirg.org/usparg.asp?id2=5235>) advocates increasing fuel efficiency standards, capping CO<sub>2</sub> from power plants, shifting investments from fossil fuels, and ratifying the Kyoto Protocol. The Sierra Club global warming site (<http://www.sierraclub.org/globalwarming/overview/solutions.asp>) advocates energy efficiency in cars, power plants, and increasing solar and wind energy. The Natural Resources Defense Council (<http://www.nrdc.org/globalWarming/gsteps.asp>) recommends energy-efficient appliances, fuel efficient cars, compact fluorescent light bulbs, planting trees, weatherizing your home, and contacting your representatives. The Union of Concerned Scientists’ site (<http://www.ucsusa.org>) recommends curbing our consumption of fossil fuels, using technologies that reduce emissions, and protecting the world’s forests.

<sup>4</sup> It’s worth noting that buying fuel efficient cars and light trucks do not directly reduce carbon dioxide emissions. Because auto manufacturers are bound only by fleet-wide averages, every low-gas-mileage car sold simply allows them to sell another gas guzzler. However, choosing efficiency is not for naught: demand for fuel efficiency may help drive technological innovation and reduce industry opposition to improved fuel economy standards. Moreover, since cars have stricter standards than light trucks, it is always better to buy the former.

<sup>5</sup> Hansen, James E. et al., “Global warming in the twenty-first century: An alternative scenario,” *Proceedings of the National Academy of Sciences*, vol. 97, no. 18, 29 Aug. 2000, p. 9876.

<sup>6</sup> Llanos, Miguel, “‘Alternative’ view offered on battling climate change; NASA scientist: CO<sub>2</sub> still a factor but other gases are key”, *MSNBC News – Environment*, 31 Aug. 2000, <http://www.msnbc.com/news/447151.asp>.

<sup>7</sup> Gore, Albert, *Earth in the Balance*, Houghton Mifflin Co., 2000, p. 176.

<sup>8</sup> Hansen, James E., “The Global Warming Debate”, NASA Goddard Institute for Space Studies Education, <http://www.giss.nasa.gov/edu/gwdebate/>.

<sup>9</sup> Moser, Susi, “Review of Hansen et al.: ‘Global warming in the twenty-first century: An alternative scenario’”, *Information Update*, The Union of Concerned Scientists, September 2000, p.2, <http://www.ucsusa.org/documents/reviewofalt.pdf>.

<sup>10</sup> SF<sub>6</sub> has a global warming potential 23,900 times that of carbon dioxide. HFC-23 has a global warming potential 11,700 times that of carbon dioxide. “Global Warming Potentials”, National Emissions, U.S. Environmental Protection Agency, <http://www.epa.gov/nonco2/econ-inv/table.html>.

<sup>11</sup> Hansen, James E. and Makiko Sato, “Trends of measured climate forcing agents”, *Proceedings of the National Academy of Sciences*, vol. 98, no. 26, 18 Dec. 2001, p. 14778-14783, <http://www.pnas.org/cgi/content/full/98/26/14778>. The estimated climate forcing of carbon dioxide from 1850 to 2000 is 1.4 W/m<sup>2</sup>, while the combined forcings of methane, CFCs, nitrous oxide, and tropospheric ozone is 1.6 W/m<sup>2</sup> when indirect effects via water and ozone are taken into account.

<sup>12</sup> Hansen and Sato, *supra note* 11. Estimated climate forcing of aerosols from 1850 to 2000, is -1.5 W/m<sup>2</sup>, larger than the positive forcing of carbon dioxide. Admittedly, estimates of aerosol forcing have large uncertainties; however, there are as likely to be too low as too high. Among aerosols, black carbon warms the atmosphere, both by absorbance and through semi-direct dirty cloud and snow effects, while sulfates, nitrates, and organic aerosols have a cooling effect, both by directly reflecting sunlight and by indirectly making clouds less bright and reducing cloud cover. Hansen, et al., *supra note* 5.

<sup>13</sup> However, Hansen points out that “Offsetting of global mean forcings does not imply that climate effects are negligible.” Hansen, et al., *supra note* 5.

<sup>14</sup> Moser, p. 1-2, *supra note* 9.

<sup>15</sup> Moser, p. 4, *supra note* 9.

<sup>16</sup> Hansen, et al., *supra note* 5.

<sup>17</sup> Animal agriculture is also a major source of nitrous oxide emissions, another important greenhouse gas 310 times more powerful than carbon dioxide. 73% of U.S. emissions of nitrous oxide come from animal grazing, manure management, and crop growing practices—with half of U.S. crops grown for livestock feed. Agricultural emissions of nitrous oxide in the U.S. increased 9% from 1990 to 2002. “Inventory of U.S. Greenhouse Gas Emissions: 1990-2002,” EPA 430-R-04-003, U.S. Environmental Protection Agency, 15 April 2004, p. ES-16, <http://www.epa.gov/globalwarming/publications/emissions>.



<sup>18</sup> Hansen and Sato, *supra note* 11. Estimated climate forcing of methane from 1850 to 2000 is 0.7 W/m<sup>2</sup>, while estimated forcing of CFCs, tropospheric ozone, and nitrous oxide combined is 0.9 W/m<sup>2</sup>.

<sup>19</sup> “Global Warming Potentials”, *supra note* 10.

<sup>20</sup> Atmospheric CO<sub>2</sub> concentrations have risen from 278 parts per million (ppm) in 1750 to 365 ppm in 1998. Atmospheric concentrations of methane have increased by 149% since 1750, from .700 ppm to 1.745 ppm. “Emissions of Greenhouse Gases in the United States 2002”, Chapter 1, Energy Information Administration, U.S. Department of Energy, October 2003, <http://www.eia.doe.gov/oiaf/1605/ggrpt>.

<sup>21</sup> Natural sources emit 770 billion metric tons of CO<sub>2</sub>, and 239 million metric tons of methane, compared to 23.1 billion and 359 million, respectively, for anthropogenic sources. “Emissions of Greenhouse Gases in the United States 2002”, *supra note* 20.

<sup>22</sup> Hansen, et al, *supra note* 5. It is also possible that warming may dampen natural sources of methane by drying out wetlands.

<sup>23</sup> Animal agriculture is responsible for 32% of global methane emissions from human activity, including 28% from domesticated livestock and 4% from livestock manure. Natural gas is the second largest source, accounting for 15% of emissions. Kruger, Dina, “The Role of ‘Other Gases’ in Addressing Climate Change”, U.S. Environmental Protection Agency, 12 Feb 2004, [http://www.iges.or.jp/en/cp/output\\_all/workshop/usjapan/pdf/06Kruger.pdf](http://www.iges.or.jp/en/cp/output_all/workshop/usjapan/pdf/06Kruger.pdf).

<sup>24</sup> “Emissions of methane from livestock”, Climate Change Fact Sheet 32, Information Unit on Climate Change (IUCC), UNEP, 1 May 1993, <http://www.unep.ch/iucc/fs032.htm>.

<sup>25</sup> World meat production reached 242 million tons in 2002, from 122 million tons in 1977, and from 44 million tons in 1950. Additionally, per capita meat consumption has more than doubled since 1950, from 17 to 39 kg per person. *Vital Signs 2003*, Worldwatch Institute, May 2003, p.30-31, <http://www.worldwatch.org/pubs/vs/2003>. The majority of the meat is consumed by developed countries. Delgado, Christopher et al., *Livestock to 2020: The Next Food Revolution*, “Food, Agriculture, and the Environment Discussion Paper 28”, International Food Policy Research Institute, May 1999, <http://www.ifpri.org/2020/dp/dp28.pdf>.

<sup>26</sup> “The Role of ‘Other Gases’ in Addressing Climate Change”, *supra note* 23. Methane emissions come particularly from ruminant animals, like cows, sheep, buffalo, and goats, but also from non-ruminants like pigs and horses. “Emissions of methane from livestock”, *supra note* 24.

<sup>27</sup> Not including methane released from manure, an adult cow produces 80-110 kg of methane a year.

“Frequent Questions”, Ruminant Livestock, U.S. Environmental Protection Agency, <http://www.epa.gov/rlep/faq.html>.

<sup>28</sup> “The Role of ‘Other Gases’ in Addressing Climate Change”, *supra note* 23.

<sup>29</sup> “Water Quality Conditions in the United States”, U.S. Environmental Protection Agency, August 2002, <http://www.epa.gov/305b/2000report>.

<sup>30</sup> Herein, the term “vegetarian” is used to refer not just to a meatless diet, but to one free of animal products, i.e. a “vegan” diet. Dairy cows, for example, produce even more methane per animal than beef cattle. Logically, the same concerns extend beyond diet to the consumption of other consumer goods derived from livestock, like wool and leather.

<sup>31</sup> Because ruminant livestock produce far more methane than non-ruminant livestock, reductions in agricultural methane can also be achieved by shifting consumption away from cows and sheep in favor of chickens and pigs. However, the benefits of such shifts are not simple; for example, in the U.S., manure from pigs produces more than five times as much methane as manure from beef cattle.

(“Inventory of U.S. Greenhouse Gas Emissions: 1990-2002”, p. 181, *supra note* 17.) Moreover, the large scale production of these animals in concentrated animal feeding operations (CAFOs) is associated with numerous other environmental harms already extensively documented by environmental organizations, making the trade of one environmental danger for another a Faustian bargain.

<sup>32</sup> The U.S. Environmental Protection Agency’s efforts to address methane from livestock amount to encouraging changes in feed and increasing the amount of product (meat, milk, offspring) per animal. Even at best such efforts are unlikely to achieve large reductions in emissions per animal, and any such reductions are easily swamped by increases in the number of animals raised overall. Methane emissions from manure can also be captured and used to produce energy.

<sup>33</sup> Hansen, et al, *supra note* 5.

<sup>34</sup> Pimentel and Pimentel estimate that the production of animal products requires more than 10 times as much fossil fuel as the production of plant foods, averaging 25 kcal of fossil fuel input per kcal of animal protein, compared with 2.2 kcal of fossil fuel input per kcal of plant protein. Pimentel, David and Marcia Pimentel, “Sustainability of Meat-Based and Plant-Based Diets and the Environment”, *American Journal of Clinical Nutrition*, Vol. 78, No. 3, September 2003, pp. 660S-663S. On CO<sub>2</sub> see Tidwell, Mike, “Food and the Climate Crisis: What You Eat Affects the Sky”, *Sierra Club Redwood Chapter Newsletter*, Dec./Jan. 2005, [http://www.redwood.sierraclub.org/articles/December\\_04/FoodClimateCrisis.html](http://www.redwood.sierraclub.org/articles/December_04/FoodClimateCrisis.html).



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