

## Connecticut Debate Association

March 1, 2014

**Darien High School, Guilford High School and Pomperaug High School**

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**Resolved: Rich countries should compensate poor countries adversely affected by climate change.**

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### **Climate Change Deaths Could Total 100 Million By 2030 If World Fails To Act**

**Reuters | Posted: 09/26/2012 5:50 am Updated: 09/27/2012 3:11 pm**

LONDON, Sept 26 (Reuters) - More than 100 million people will die and the global economy will miss out on as much as 3.2 percent of its potential output annually by 2030 if the world fails to tackle climate change, a report commissioned by 20 governments said on Wednesday.

As global average temperatures rise due to greenhouse gas emissions, the effects on the planet, such as melting ice caps, extreme weather, drought and rising sea levels, will threaten populations and livelihoods, said the report conducted by humanitarian organisation DARA.

It calculated that five million deaths occur each year from air pollution, hunger and disease as a result of climate change and carbon-intensive economies, and that toll would likely rise to six million a year by 2030 if current patterns of fossil fuel use continue.

More than 90 percent of those deaths will occur in developing countries, said the report that calculated the human and economic impact of climate change on 184 countries in 2010 and 2030. It was commissioned by the Climate Vulnerable Forum, a partnership of 20 developing countries threatened by climate change.

"A combined climate-carbon crisis is estimated to claim 100 million lives between now and the end of the next decade," the report said.

It said the effects of climate change was already costing the global economy a potential 1.6 percent of annual output or about \$1.2 trillion a year, and this could double to 3.2 percent by 2030 if global temperatures are allowed to rise.

#### **COUNTING THE COST**

Responding to the report, Oxfam International said the costs of political inaction on climate were "staggering".

"The losses to agriculture and fisheries alone could amount to more than \$500 billion per year by 2030, heavily focussed in the poorest countries where millions depend on these sectors to make a living," said executive director Jeremy Hobbs.

British economist Nicholas Stern told Reuters earlier this year investment equivalent to 2 percent of global GDP was needed to limit, prevent and adapt to climate change.

His report on the economics of climate change in 2006 said that without any action to tackle climate change, the overall costs and risks of climate change would be equivalent to a cut in per-capita consumption of perhaps up to 20 percent.

Temperatures have already risen by about 0.8 degrees Celsius above pre-industrial times. Almost 200 nations agreed in 2010 to limit the global average temperature rise to below 2C (3.6 Fahrenheit) to avoid dangerous impacts from climate change.

But climate scientists have warned that the chance of limiting the rise to below 2C is getting smaller as global greenhouse gas emissions rise due to burning fossil fuels.

The world's poorest nations are the most vulnerable as they face increased risk of drought, water shortages, crop failure, poverty and disease. On average, they could see an 11 percent loss in GDP by 2030 due to climate change, DARA said.

"One degree Celsius rise in temperature is associated with 10 percent productivity loss in farming. For us, it means losing about 4 million metric tonnes of food grain, amounting to about \$2.5 billion. That is about 2 percent of our GDP," Bangladeshi Prime Minister Sheikh Hasina said in response to the report.

"Adding up the damages to property and other losses, we are faced with a total loss of about 3-4 percent of GDP."

Even the biggest and most rapidly developing economies will not escape unscathed. The United States and China could see a 2.1 percent reduction in their potential GDPs by 2030, while India could experience a more than 5 percent loss of potential output.

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## UN climate change talks in Warsaw hampered by development gap

Al Jazeera, November 20, 2013 10:12PM ET

Developing countries walk out of a meeting amid a disagreement on who should pay for climate change problems

Developed and developing nations were deadlocked Wednesday over how to raise aid to help developing countries cope with global warming, in another setback at United Nations climate talks in Warsaw seeking progress toward a new global climate accord.

With two days left in talks trying to reach a new agreement meant to be concluded in 2015 and enter into force from 2020, negotiators for developing nations including China walked out early Wednesday from a meeting about compensation for the impact of global warming.

"We do not see a clear commitment of developed parties to reach an agreement," said Rene Orellana, head of Bolivia's delegation.

Bolivia and other developing countries accused wealthier nations of failing to show willingness to discuss aid or compensation for losses and damage widely blamed on global warming, such as rising sea levels and creeping desertification.

For many less-developed countries, the devastation of Typhoon Haiyan in the Philippines has raised the urgency of compensation.

Global economic losses caused by extreme weather have risen to nearly \$200 billion a year over the past decade and look set to increase further as climate change worsens, the World Bank said this week.

"The compensation that those countries require is something that is absolutely fundamental and crucial," said India's environment minister, Jayanthi Natarajan.

Apportioning blame

The question of who is to blame for global warming is central for developing countries, who say they should receive financial support from richer nations to help make their economies greener, adapt to climate shifts and cover the costs of unavoidable damage caused by warming temperatures.

Also, they say the fact that richer nations have historically released the biggest amounts of heat-trapping CO<sub>2</sub> – by burning fossil fuels for more than 200 years – means they need to take the lead in reducing current emissions.

In Warsaw, developing nations are coming up with new ways to make their point. Brazil has proposed creating a formula to calculate historical blame.

"They must know how much they are actually responsible ... for the essential problem of climate change," Brazilian negotiator Raphael Azeredo said.

Developed nations blocked that proposal, however, saying the world should look at current and future emissions when dividing up the responsibility for global warming.

China, considered a developing nation at these talks, overtook the United States to become the world's biggest carbon polluter in the last decade, and developing countries as a whole now have higher emissions than the developed world.

To focus only on past emissions "seems to us as very partial and not very accurate," Todd Stern, the U.S. climate envoy, said.

The U.S. wants to get rid of the U.N.'s current division between developed and developing nations. Stern noted that a 2007 study showed that by 2020 the all-time emissions of developing countries will exceed those of the developed world, due to emissions growth in large emerging economies like China and India.

Those countries are trying to develop in a cleaner way, but say it is unfair to expect them to abstain from the more polluting fuels that built Western economies into powerhouses with high living standards.

Finding a way to share the burden of emissions cuts in an equitable manner is one of the top challenges for the climate negotiators, whose overall goal is to keep average global temperature from rising more than 3.6 degrees F from what they were in preindustrial times.

Scientists say the global average temperature has already risen by 1.4 F, resulting in melting glaciers, rising sea levels and other climate impacts.

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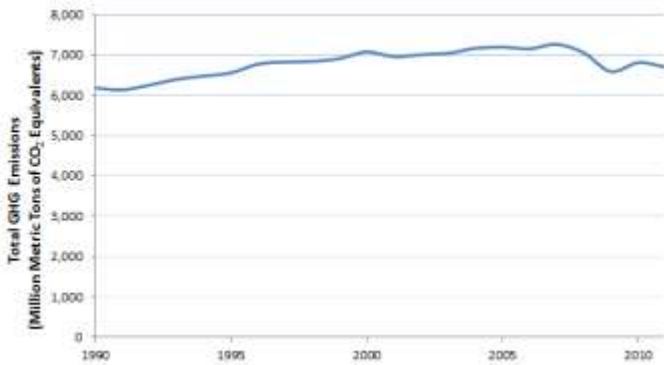
### (US) Environmental Protection Agency website on domestic emissions

EPA tracks total U.S. emissions by publishing the *Inventory of U.S. Greenhouse Gases and Sinks*. This annual report estimates the total national greenhouse gas emissions and removals associated with human activities across the United

States.

### Emissions and Trends

Since 1990, U.S. greenhouse gas emissions have increased by about 8%. From year to year, emissions can rise and fall

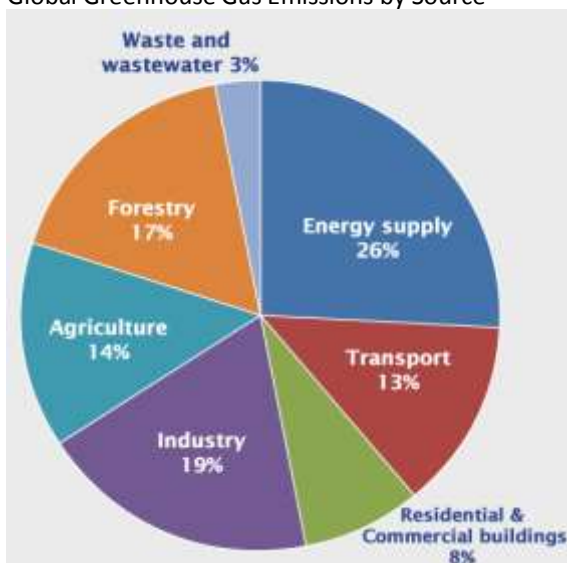


due to changes in the economy, the price of fuel, and other factors. In 2011, U.S. greenhouse gas emissions decreased compared to 2010 levels. This decrease was primarily due to a decrease in the carbon intensity of fuels consumed to generate electricity due to a decrease in coal consumption, with increased natural gas consumption and a significant increase in hydropower used. Additionally, relatively mild winter conditions, especially in the South Atlantic Region of the United States where electricity is an important heating fuel, resulted in an overall decrease in electricity demand in most sectors.

Total U.S. Greenhouse Gas Emissions, 1990-2011

All emission estimates from the *Inventary of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*.

Global Greenhouse Gas Emissions by Source



Source: [IPCC \(2007\)](#); based on global emissions from 2004. Details about the sources included in these estimates can be found in the *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.

CO<sub>2</sub> that ecosystems remove from the atmosphere. The amount of CO<sub>2</sub> that is removed is subject to large uncertainty, although recent estimates indicate that on a global scale, ecosystems on land remove about twice as much CO<sub>2</sub> as is lost by deforestation.<sup>[2]</sup>

- **Agriculture** (14% of 2004 GHG emissions) - global greenhouse gas emissions) - Greenhouse gas emissions from agriculture mostly come from the management of agricultural soils, livestock, rice production, and biomass burning.
- **Transportation** (13% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector primarily involve fossil fuels burned for road, rail, air, and marine transportation. Almost all (95%) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel.

### (US) Environmental Protection Agency website report on global emissions

#### Global Emissions by Source

Global greenhouse gas emissions can also be broken down by the economic activities that lead to their production.<sup>[1]</sup>

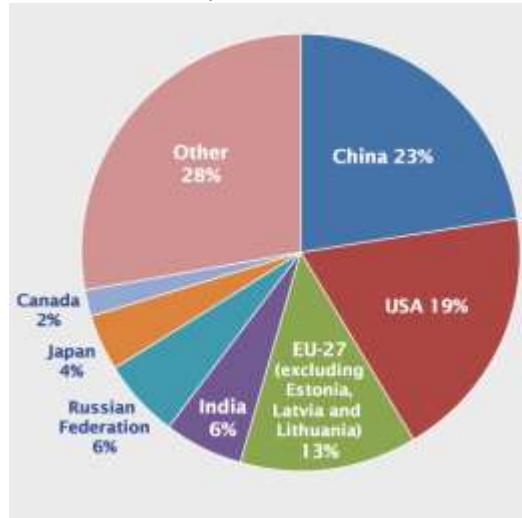
- **Energy Supply** (26% of 2004 global greenhouse gas emissions) - The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions.
- **Industry** (19% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from industry primarily involve fossil fuels burned on-site at facilities for energy. This sector also includes emissions from chemical, metallurgical, and mineral transformation processes not associated with energy consumption. (Note: Emissions from electricity use are excluded and are instead covered in the Energy Supply sector.)
- **Land Use, Land-Use Change, and Forestry** (17% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector primarily include carbon dioxide (CO<sub>2</sub>) emissions from deforestation, land clearing for agriculture, and fires or decay of peat soils. This estimate does not include the



**Trends in Global Emissions**

Global Carbon Dioxide (CO<sub>2</sub>) emissions from fossil-fuels 1900-2008

2008 Global CO<sub>2</sub> Emissions from Fossil Fuel Combustion and some Industrial Processes (million metric tons of CO<sub>2</sub>)



Source: [National CO<sub>2</sub> Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2008](#).

emissions, or about 16% of emissions from fossil fuel sources. Tropical deforestation in Africa, Asia, and South America are thought to be the largest contributors to emissions from land-use change globally.<sup>[31]</sup> In areas such as the United States and Europe, changes in land use associated with human activities have the net effect of absorbing CO<sub>2</sub>, partially offsetting the emissions from deforestation in other regions.

- **Commercial and Residential Buildings** (8% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector arise from on-site energy generation and burning fuels for heat in buildings or cooking in homes. (Note: Emissions from electricity use are excluded and are instead covered in the Energy Supply sector.)
- **Waste and Wastewater** (3% of 2004 global greenhouse gas emissions) - The largest source of greenhouse gas emissions in this sector is landfill methane (CH<sub>4</sub>), followed by wastewater methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Incineration of some waste products that were made with fossil fuels, such as plastics and synthetic textiles, also results in minor emissions of CO<sub>2</sub>.

Source of data: [Boden, T.A., G. Marland, and R.J. Andres \(2010\). Global, Regional, and National Fossil-Fuel CO<sub>2</sub> 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\_V2010.

Global carbon emissions from fossil fuels have significantly increased since 1900. Emissions increased by over 16 times between 1900 and 2008 and by about 1.5 times between 1990 and 2008.

“Emissions of non-CO<sub>2</sub> greenhouse gases have also increased significantly since 1900. To learn more about past and projected global emissions of non-CO<sub>2</sub> gases, please see the EPA report {[Global Anthropogenic Non-CO<sub>2</sub> Emissions: 1990-2000](#)}.

**Emissions by Country**

In 2008, the top carbon dioxide (CO<sub>2</sub>) emitters were China, the United States, the European Union, India, the Russian Federation, Japan, and Canada. These data include CO<sub>2</sub> emissions from fossil fuel combustion, as well as cement manufacturing and gas flaring. Together, these sources represent a large proportion of total global CO<sub>2</sub> emissions.

Emissions and sinks related to changes in land use are not included in these estimates. However, changes in land use can be important - global estimates indicate that deforestation can account for 5 billion metric tons of CO<sub>2</sub>

**You Can Have Either Climate Justice or a Climate Treaty, Not both.**

**Slate, Nov. 19 2013 11:19 AM, By [Eric Posner](#)**

In the wake of the devastation to the Philippines caused by Typhoon Haiyan, a long-standing claim for “climate justice” has re-emerged with new force. Countries vulnerable to more devastation, as temperatures rise, want rich countries that have benefited from industry that produces greenhouse gas emissions to pay them reparations. Advocates argue that climate change negotiations, currently being held in Warsaw, should aim for a climate treaty that forces the climate wrongdoers to pay the climate victims. This would mean countries like Bangladesh, the Philippines, and Kenya getting

money from countries like the United States so that they don't alone bear the cost of a global carbon dioxide overload that they did little to cause. It sounds great—but such an approach would doom the prospects of a climate treaty, and the argument for it doesn't add up.

Climate justice trades on a powerful moral intuition, embodied long ago in Aristotle's principle of corrective justice: A person who wrongfully harms another person owes compensation to the victim. The greenhouse gases in the atmosphere today are mostly the result of fossil fuel consumption that goes back more than a century, most of which took place in the United States and Europe. These countries are thus disproportionately responsible for the harm being visited on poor countries.

But there is less to this argument than meets the eye.

The first thing to be clear about is that blame for Typhoon Haiyan cannot be assigned to any particular country. There is no way to show that the typhoon would not have occurred but for emissions of greenhouse gases. It is not even clear that emissions increase the likelihood of typhoons. The strongest point with scientific backing is that over the long term, countries will generally suffer climate-related harms as a result of greenhouse gas emissions, and poor countries will suffer the most.

Advocates for climate reparations argue that Western countries enriched themselves for decades while disregarding the well-being of people living elsewhere. But the industrial revolution also enriched non-Western countries. Filipinos, for example, have gained immensely—in terms of life expectancy, health, education, and material comforts—relative to a world in which fossil fuels were never burned.

If rich countries must pay for harm caused by industrialization, then they will be able to argue that the benefits poor countries enjoy as a result of industrialization should be subtracted from the climate-related losses. Maybe, according to this view, on balance the poor countries should pay the rich. Of course, poor countries could add charges for colonialism, the slave trade, and the Crusades. To state the principle is to show why this won't work: Climate justice will turn into a world-historical accounting of all the benefits and harms that all countries have imposed on all others—a futile debate if there ever was one.

Another problem: Many of the countries emitting high levels of greenhouse gas are themselves poor. Although the United States is currently the second-worst yearly emitter, others at the top include China, Indonesia, Brazil, India, and Iran. If culpability rests on per capita rather than absolute emissions, then the worst countries include Montenegro, Equatorial Guinea, and Belize. Or if culpability is calculated in terms of emissions relative to the size of the economy, then the worst countries include the Central African Republic, Burundi, and Zambia. (My source is the [World Resources Institute's Climate Data Explorer](#).) A climate treaty that aims for corrective justice would thus burden a lot of poor countries.

And even if you move past all those objections, you still need to establish that the rich countries acted culpably by emitting greenhouse gases. The issue here is that most emissions in the United States took place before the 1990s, when few Americans knew about, or understood, the dangers of climate change. Even since then, it is difficult to argue that Americans act in a blameworthy fashion by heating their homes and firing up their laptops, which is what everyone does albeit usually to lesser (as well as varying) degrees. We might blame ourselves for failing to elect governments that unilaterally cut emissions, but our governments have justifiably held out for other countries like China to agree to do their share. After all, unilateral emission cuts will do little to solve the problem.

One of the most challenging features of the climate change problem is the time lag between emission and harm. It was our ancestors who emitted much of the stock of greenhouse gases, and most of the harm they caused will not take place until additional decades have passed. If a climate treaty compelled monetary transfers from historic wrongdoers to victim countries today, these transfers would be to people who have not been harmed from people who have not harmed them.

Yet the people who will live in the Philippines, India, and Kenya decades from now will be much richer than the people who live in those countries today. Why should a climate treaty compensate wealthy people in the future who will be somewhat less wealthy than they would have been if greenhouse gas emissions had taken place at lower levels?

In the end, the likely result of pushing for climate justice will be no climate treaty at all. As [Todd D. Stern, the State Department's envoy on climate issues, said last month](#): "Lectures about compensation, reparations and the like will produce nothing but antipathy among developed country policy makers and their publics."

Treaties are deals that countries enter into in order to advance their interests. A climate treaty is possible only if it makes all countries better off than the status quo. China must believe that it loses more from future climate damage than it loses from the increase in the price of energy that would result from greenhouse gas emission limits. So must the United States, Russia, Bangladesh, and Kenya. Because all countries weigh the benefits and costs differently, they all support different emission limits. A feasible treaty must walk an extraordinarily fine line, leaving no room for righting the

wrongs of history.

This is not to say that the rich countries should ignore the moral claims of poor countries. But these claims should be based on their poverty, not on a historical accounting of the costs and benefits of the Industrial Revolution, colonialism, and the Crusades. Aid and other forms of assistance—like U.S. aid to the victims of Typhoon Haiyan, based on humanitarian considerations rather than corrective justice—already take place outside any climate treaty.

And that is where they should stay. A feasible treaty is not the same as a treaty based on reparations or redistribution. You can have justice or you can have a climate treaty. Not both.

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## Five Truths About Climate Change

### The Wall Street Journal, 6 October 2011, By Robert Bryce

Over the past two months, environmental activists have held protests at the White House and elsewhere hoping to convince the Obama administration to deny a permit for the proposed Keystone XL oil pipeline from Canada to the Gulf Coast. Some of those same activists have launched a series of demonstrations called "Moving Planet" to move "the planet away from fossil fuels towards a safer climate future." And next month, leaders from dozens of countries will meet at the 17th United Nations Framework Convention on Climate Change in Durban, South Africa.

But for all of the sturm und drang about climate change, what has actually happened? It's time to acknowledge five obvious truths about the climate-change issue:

1) The carbon taxers/limiters have lost. Carbon-dioxide emissions have been the environmental issue of the past decade. Over that time period, Al Gore became a world-renowned figure for his documentary, "An Inconvenient Truth," for which he won an Oscar. In 2007, he, along with the Intergovernmental Panel on Climate Change (IPCC), collected a Nobel Peace Prize for "informing the world of the dangers posed by climate change." That same year, the IPCC released its fourth assessment report, which declared that "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas emissions." (Emphasis in original.)

Two years later, Copenhagen became the epicenter of a world-wide media frenzy as some 5,000 journalists, along with some 100 world leaders and scores of celebrities, descended on the Danish capital to witness what was billed as the best opportunity to impose a global tax or limit on carbon dioxide.

The result? Nothing, aside from promises by various countries to get serious -- really serious -- about carbon emissions sometime soon.

Here's a reality check: During the same decade that Mr. Gore and the IPCC dominated the environmental debate, global carbon-dioxide emissions rose by 28.5%.

Those increases reflect soaring demand for electricity, up by 36%, which in turn fostered a 47% increase in coal consumption. (Natural-gas use increased by 29% while oil use grew by 13%.) Carbon-dioxide emissions are growing because people around the world understand the essentiality of electricity to modernity. And for many countries, the cheapest way to produce electrons is by burning coal.

2) Regardless of whether it's getting hotter or colder -- or both -- we are going to need to produce a lot more energy in order to remain productive and comfortable.

3) The carbon-dioxide issue is not about the United States anymore. Sure, the U.S. is the world's second-largest energy consumer. But over the past decade, carbon-dioxide emissions in the U.S. fell by 1.7%. And according to the International Energy Agency, the U.S. is now cutting carbon emissions faster than Europe, even though the European Union has instituted an elaborate carbon-trading/pricing scheme. Why? The U.S. is producing vast quantities of cheap natural gas from shale, which is displacing higher-carbon coal.

Meanwhile, China's emissions jumped by 123% over the past decade and now exceed those of the U.S. by more than two billion tons per year. Africa's carbon-dioxide emissions jumped by 30%, Asia's by 44%, and the Middle East's by a whopping 57%. Put another way, over the past decade, U.S. carbon dioxide emissions -- about 6.1 billion tons per year -- could have gone to zero and yet global emissions still would have gone up.

4) We have to get better -- and we are -- at turning energy into useful power. In 1882, Thomas Edison's first central power station on Pearl Street in lower Manhattan converted less than 3% of the heat energy of the coal being burned into electricity. Today's best natural-gas-fired turbines have thermal efficiencies of 60%. Nearly all of the things we use on a daily basis -- light bulbs, computers, automobiles -- are vastly more efficient than they were just a few years ago. And over the coming years those devices will get even better at turning energy into useful lighting, computing and motive power.

5) The science is not settled, not by a long shot. Last month, scientists at CERN, the prestigious high-energy physics lab in Switzerland, reported that neutrinos might -- repeat, might -- travel faster than the speed of light. If serious scientists can question Einstein's theory of relativity, then there must be room for debate about the workings and complexities of the Earth's atmosphere.

Furthermore, even if we accept that carbon dioxide is bad, it's not clear exactly what we should do about it. In September, Tom Wigley of the National Center for Atmospheric Research in Boulder published a report that determined "switching from coal to natural gas would do little for global climate." Mr. Wigley found that the particulates put into the atmosphere by coal-fired power plants, "although detrimental to the environment, cool the planet by blocking incoming sunlight."

If Mr. Wigley's right, then using sources that emit no particulates, like nuclear and natural gas, will not make a major difference in averting near-term changes in the climate caused by carbon dioxide. But then -- and here's the part that most media outlets failed to discuss when reporting on the Wigley study -- widespread use of renewables such as wind and solar won't help much, either.

Will Happer, a professor of physics at Princeton and a skeptic about global climate change, recently wrote that the "contemporary 'climate crusade' has much in common with the medieval crusades." Indeed, politicians and pundits are hectoring to adhere to the orthodoxy of the carbon-dioxide-is-the-only-climate-problem alarmists. And that orthodoxy prevails even though the most ardent alarmists have no credible plans to replace the hydrocarbons that now provide 87% of the world's energy.

It's time to move the debate past the dogmatic view that carbon dioxide is evil and toward a world view that accepts the need for energy that is cheap, abundant and reliable.

Mr. Bryce is a senior fellow at the Manhattan Institute. His latest book, "Power Hungry: The Myths of 'Green' Energy and the Real Fuels of the Future" (PublicAffairs, 2010), was recently issued in paperback.

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## **The Problem With Geoengineering: What if It Works?**

### **The Atlantic, 10-3-11, By Rebecca J. Rosen**

*The postponement of a massive experiment is a chance to think about what would happen if we had the power to control the weather*

A major experiment to use a one kilometer-long hose to pump water droplets into the atmosphere as a precursor to a large-scale geoengineering interventions has been postponed for six months. More than 50 groups, led by Canada's ETC Group, had recently signed a letter condemning the field trial, calling it a "Trojan Hose" and imploring the British government to suspend it until an international agreement to govern geoengineering efforts has been reached. The letter read in part:

It is unacceptable for the UK government to sponsor - even chair - discussions at the [Convention on Biological Diversity] while simultaneously funding experiments and developing hardware for the deployment of stratospheric aerosols, one of the most controversial geoengineering technologies under discussion. This apparent conflict of interest will undermine the credibility of the UK, not only at the CBD, but also in other climate-related negotiations, notably at the UN Framework Convention on Climate Change and the UN Conference on Sustainable Development (Rio+20).

That said, protecting the political process from these sorts of conflicts of interest is a lesser concern to geoengineering's critics than the potential moral hazards and environmental damage. What happens if something goes wrong? What if efforts to right the planet's climate result in famine or mass extinctions?

Such scenarios are horrifying, but even they don't capture the full range of problems that geoengineering poses. The failure of geoengineering could be a nightmare, but perhaps even scarier is the possibility that geoengineering might actually work.

This is a tough line to toe. If we could engineer ourselves out of the calamity that is global warming, shouldn't we obviously do it? But we have to wrestle with the possibility that the ability to control the weather is a power so massive that our international political system could not cope with it. One paper in *Nature* argued that "it may not be possible to stabilize the climate in all regions simultaneously" using solar deflection schemes. Who would decide which places get to have which climates? How would the world make those decisions? Could they ever even approximate fairness? Or, as James R. Fleming, author of *Fixing the Sky*, wrote in *The Wilson Quarterly* (my former stomping grounds):

While most of the world may want to maintain or increase polar sea ice, Russia and some other nations have historically desired an ice-free Arctic ocean, which would liberate shipping and open potentially vast oil and mineral deposits for exploitation. And an engineered Arctic ice sheet would likely produce shorter growing seasons and harsher winters in Alaska, Siberia, Greenland, and elsewhere, and could generate super winter storms in the midlatitudes.

Such concerns may raise some anti-science red flags, but I think it's important to note that the problem isn't science per se but the ability to use it fairly and safely.

In an interview in *Wired*, Alexis Madrigal asked Eli Kintisch, author of *Hack the Planet*, about a statement from atmospheric scientist David Battisti that, "You hope to God this is never used but if you have to use it, you better know how it behaves." Kintisch replies:

At this point, a lot of scientists feel the cat is out of the bag. If anything, a desperate politician 30 years from now may suddenly decide, "I need to cool the planet." And if we don't study it, scientists won't have any way to warn this leader of what the consequences will be. From that perspective there is a Pandora's box that has been opened.

Geoengineering is a bad idea whose time has come. It is something that you have to study and hope to never use. [For the atomic scientists], the other side has nuclear weapons and they are pointed at you, so you have no choice but to develop a deterrent. In this case, the nuclear weapons are the unknown chance that the planet's sensitivity to CO2 is very high and will respond to some of these worst-case tipping points.

Kintisch is right that if you're going to try to manipulate the climate, it's better to at least know what you're doing. But if it is ever possible to control the weather, it will be very, very difficult to prevent regimes from doing so unilaterally. The international community has so far proved to be incapable of dealing with global climate change. Why would it be any better equipped to control the weather? The ETC Group is right that we should create international standards for how we would use this power if we had it, before we do actually have it.

The human desire to control the weather is an ancient one, seen in various rain dances and prayers across religions and continents. If one day we can control the weather, we may long for the old days, when the skies were out of our control and we didn't know how good we had it.

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## **We Can't "Fix" the Planet**

Slate, Brad Allenby, Posted Friday, Sept. 24, 2010, at 10:12 AM ET

There's no easy solution for climate change. It's a symptom of our man-made world.

It's time to reframe the debate over geoengineering. Proponents argue that we have no other choice than to consider schemes like salting the skies with sulfate particles or peppering the ocean with algae. The negotiators failed at Copenhagen, they say, and cap-and-trade seems moribund in Congress—all while the climate warms unabated. Opponents of a technological quick fix worry that a large-scale deployment of geoengineering might only make things worse and that the very mention of it could erode the world's resolve to change our habits and reduce consumption of fossil fuels. These are relatively simple arguments, pro and con, and easy to understand. But that's the problem: Neither side grapples with the complex natural, technological, and social systems that are in play.

The traditional views of geoengineering assume that climate change is a problem that can be solved by appropriate remedies—whether the Kyoto Protocol or deployment of geoengineering technologies—and that any such solution can exist apart from its context. In other words, it's classic reductionism: Isolate a problem, analyze, and solve. But this approach would only make sense if two core assumptions were valid: first, that climate change is a problem amenable to a simple and direct intervention (whether it's legal or technological); second, that climate change can be separated from everything else.

Neither of these assumptions can withstand serious scrutiny. Climate change is not a problem to be solved; it is a condition arising from a vast network of built, natural, and social systems that reflect the desires of 7 billion people for a better life. They want food, including more meat as they can afford it; they want clean water, which takes energy to produce; they want material goods that will help them, and their children, lead full and worthwhile lives. Look at the Earth from space at night, and you see our energy and radiation shining in the dark; look at it during the day, and you see cities, agricultural regions, skies full of airplanes, and roads full of cars. You see, in other words, a world in which human activity affects everything. Climate change is a symptom of a fundamental and complex reality: the evolution of the anthropogenic Earth.

We cannot simply disconnect the climate from other Earth systems, like the global economy, or from competing cultural values, like the importance of equal opportunity, freedom to travel, and the just distribution of wealth. Change global patterns of incoming solar energy, and you don't "fix" global climate change so much as modify the atmosphere again, in a different way. Any serious attempts at fighting global warming are bound to have effects that ripple through overlapping domains: Corn ethanol, for example, was supposed to help curtail carbon emissions; not only did it fail in that regard, but the subsidized glut of production distorted food markets and starved poor people around the globe. A childish refusal to perceive such linkages won't make them go away.

More than other proposed responses to climate change, geoengineering buys into the myth that we're dealing with an independent, solvable problem. It is, in essence, a proposal to justify the deployment of technologies that are powerful



enough to affect the fundamental climate cycle of an entire planet—all based on the assumption that average temperature is the only thing that matters. Stratospheric balloons could indeed reflect some sunlight back into space, but they might also disrupt Asian monsoons, resulting in widespread famine. We might try to create reflective clouds by injecting sulfur particles into the air, but we might also end up acidifying rain all over the world. The point is not that these geoengineering technologies (and others) are unsafe: It may indeed be worth the risk to deploy them one day. The point is that unless we think about them as multidimensional interventions that affect the world in many different ways and at many different scales, we're simply ignoring reality (willfully or not). Any technology of sufficient power will have profound and unpredictable impacts across economic, cultural, and political systems—think of the railroads, of cars, of the Internet, of Google.

The root problem here is psychological, not technical; it's a deliberate retreat from complexity into fantasy and whimsy. Geoengineering should not be rejected out of hand, but rather redefined so it can be taken more seriously. First, we shouldn't limit the discussion to those schemes or technologies that make the adjustment of the climate their primary or "intentional" goal. More mundane research programs or policies that might ameliorate global warming as a side effect should be considered alongside the Pinatubo Option and artificial trees. For example, growing beef in factories rather than in cows would have substantial climate-change benefits, since each living cow emits some 50 kg of methane a year. (Some estimate that shifting away from livestock agriculture could reduce greenhouse-gas emissions by more than 15 percent.) Factory meat would also reduce soil erosion and nitrogen loading, and free up land for other uses, such as growing biofuels. And that's just one example. There are lots of other things we could do that would meet a broader, more reasonable definition of geoengineering.

Geoengineering should be thought of not as a set of wild proposals fit for a mad scientist, but as a portfolio of viable technologies that may or may not be conceived as silver bullets for climate change on their own terms. Rather than simply laying plans for the deployment of one or another, we should make available a suite of possible approaches, each with its own costs and benefits, that could be combined as needed in this complex, confused, and unpredictable world of ours. We have made this an anthropogenic planet; now we have to take responsibility for it.

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## **The People v. CO2**

**Slate, By Rachel Morris, Posted Tuesday, April 20, 2010, at 9:42 AM ET**

The coming tide of international climate lawsuits.

The Prunéřov power station is the Czech Republic's biggest polluter: Its 900-foot-high smokestack\* pushes plumes of white smoke high above the flat, featureless fields of northern Bohemia. Prunéřov reliably wins a place on lists of Europe's dirtiest power plants, emitting 11.1 million tons of carbon dioxide each year. So when CEZ Group, the state-controlled utility, proposed an overhaul to extend the facility's life for another quarter of a century, protests flared—including one from a place about as far from the sooty industrial region as you can get, a place of tropical temperatures and turquoise seas with not a smokestack in sight. The Federated States of Micronesia, some 8,000 miles away in the Pacific Ocean, has lodged a legal challenge to the Prunéřov plant on the grounds that its chronic pollution threatens the island nation's existence.

Is that, well—legal, you might ask? In international law, there's an established principle called transboundary harm, which means that if a Canadian factory belches toxic chemicals into a river, fouling a reservoir in Vermont, sooner or later the people at the Canadian factory will be hearing from some American lawyers. For the first time, Micronesia is applying this tenet to climate change—arguing that its survival is jeopardized by any large power plant that doesn't curb its carbon footprint. "They're using a very creative approach to the international legal process," says Durwood Zaelke, president of the Institute for Governance and Sustainable Development.

A groundbreaking transnational legal action might sound like a tall order for a country of 107,000 people whose most high-profile endeavor to date has been hosting the 16th season of *Survivor*. Yet Micronesia has incentives to get innovative. NASA satellite maps show that Micronesia inhabits the spot where sea levels are rising most rapidly. For the past three years, abnormally high tides have assailed the islands, souring the soil and salting the aquifer, making it impossible to grow taro, one of the country's few staple foods. Last year, the government declared a national emergency and spent more than 7 percent of its budget of \$42 million to ferry bags of rice and drinking water to its low-lying islands. Professor Charles Fletcher, a geologist from the University of Hawaii who has conducted research in Micronesia, said, "This is the first situation I'm aware of where sea-level rise has led to threats to food and water security."

Micronesia made its move against the Pruněřov plant on Jan. 4, when it filed a formal objection under the Czech Republic's environmental impact assessment law. (Czech law doesn't limit which nations can participate in this process.) In response, the government first postponed its decision on the plant, and in February the environmental minister announced that he was calling in an independent Norwegian firm to assess the plant's carbon output. Environmental lawyers hope Micronesia's gambit will encourage similar challenges elsewhere. "We would like to make it a precedent," said Jiri Nezhyba, an attorney with the Czech Environmental Law Service, who worked on the case.

With the world's top carbon-emitting nations seemingly unable to come up with a binding climate treaty, both environmental lawyers and representatives of small island nations are increasingly looking for other forms of leverage. "If we can take our case to an international court, that would be an avenue the government may have to explore," said Andrew Yatilman, Micronesia's director of environment and emergency management.

One lawyer thinking along similar lines is Matthew Pawa, one of the lead attorneys on a pioneering lawsuit in which the Inupiat community of Kivalina, Alaska, is suing 19 U.S. oil and utility companies, including BP and ExxonMobil. The case is based in part on a simple nuisance claim—the same common-law principle you might deploy to sue your neighbor if he opened an obnoxiously loud nightclub next door. Kivalina claims that the companies' carbon emissions are helping to melt the sea ice on which the village sits, which will require it to be relocated at a cost of up to \$400 million. That case was dismissed by a California court but is now on appeal; Pawa is seeking overseas clients, too.

Environmental lawyers point to several possibilities for international claims. Countries affected by oceanic changes could seek redress via the Convention on the Law of the Sea, although it can't be used against the US—which hasn't ratified the treaty. A nation could go after a polluter in the International Court of Justice on the grounds that its citizens' human rights would be violated if their country were wiped off the map—but, again, the US is not a signatory, and the ICJ is somewhat toothless. A number of lawyers told me that the most promising avenue might be the common-law doctrine used in the Kivalina case. Any nation could sue a U.S. company in U.S. court for a "nuisance" caused by climate change—Tuvalu v. ExxonMobil, if you will. And a couple of island nations that were once American protectorates, like Micronesia and Palau, have legal compacts with the United States that give them more powerful tools: They could potentially sue a company or even a government agency, using domestic statutes such as the Clean Air Act.

Which is not to say that winning will be easy. While the scientific evidence of climate change has hardened to the point of irrefutability, blaming someone for it in a court of law is a knottier business. U.S. judges have swatted down most climate lawsuits either by ruling that global warming is for Congress to address or by finding that it would be unfair to hold a handful of companies responsible for damage caused by centuries of pollution across the world.

Nevertheless, industries are bracing for a tide of climate lawsuits. The major insurer Swiss Re has warned that "climate change-related litigation could become a significant issue within the next couple of years." Pawa compares this nascent field to the epic court battles over tobacco and asbestos. "It's a process of learning by doing," said Pawa. "Just by bringing these cases over and over again, the judiciary [and] the public get used to the idea of liability." According to a forthcoming United Nations study, the world's 3,000 biggest public companies could be on the hook for \$2.2 trillion—more than 30 percent of their profits—if they were made to pay for the fallout of their carbon emissions.

In truth, legal challenges don't even need to reach that point to serve a purpose. "Lawsuits are part of an overall strategy to make the U.S. move," one lawyer told me. "They could be a chip in some grand bargain for legislation: We're going to eliminate liability for climate change, but we're going to get a really good deal on mitigation."

Hauling global companies to court would be an audacious gamble for tiny nations that rely heavily on foreign aid. "There are huge political risks," said Stuart Beck, Palau's ambassador to the United Nations. But with world leaders already downplaying hopes for a binding treaty at the climate talks in Mexico this November, vulnerable countries are contemplating which is the larger hazard: angering their donors or waiting patiently until the only aid they require is a bulk purchase of plane tickets. As attorney Pawa puts it, "Countries are literally being driven out of existence—they are going to turn to whatever systems they can. Right now they're looking to require developed nations to reduce emissions. In the future, I think they'll be looking for compensation."

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