



GROUP OF EIGHT

Global Warming and the Post-Kyoto Agenda

By Chris Coey

Introduction

In 2007 the Nobel Peace Prize, was jointly bestowed on Al Gore and the United Nations Intergovernmental Panel on Climate Change (IPCC). This decision was widely praised and celebrated by supporters of the theory of human-induced global warming. Gore, a former US Vice President turned environmental activist, has worked tirelessly to convince the public and policymakers about human-induced global warming. The IPCC, an intergovernmental body set up by the UN and charged with assessing the scientific basis of human-induced climate change, has concluded that the global climate is changing, and has blamed much of this change on excessive **anthropogenic** greenhouse gas emissions. Despite this conclusion from the world's highest authority on climate change research, the theory of human-induced global warming continues to evoke opposition from many conservatives and even a handful of scientists. Due to the on-going controversy of this issue, the awarding of the 2007 Nobel Peace Prize to Vice President Gore and the IPCC was extremely contentious.

anthropogenic –
caused by human beings; produced during human economic activity

Background

Year by year, as the amount of climatic data expands, groundbreaking new studies are conducted, and more advanced climate-modeling techniques are used, the theory of human-induced global warming is becoming less controversial. The idea that the release of anthropogenic greenhouse gases might be causing a global temperatures to rise and climatic patterns to be affected was hypothesized long ago. In 1938, Guy Stewart Callendar, a steam power engineer who studied weather statistics, proposed to the Royal Meteorological Society that the Earth was getting warmer. He suggested that this warming was due to **the Greenhouse Effect**, a scientific analogy to the glass structures that allow sunlight in and trap the heat produced. Callendar's idea of global warming was rejected as ludicrous, partly because the evidence available at the time was not strong enough, and perhaps because of a reluctance to accept an idea, which would have such radical consequences (Strom 11).

Greenhouse Effect- *the process by which the earth is heated due to the absorption of infrared radiation*

Although the scientific community did not accept global warming in the 1930s, the theory of global warming was recognized as plausible. In 1824 French physicist Joseph Fourier discovered the Greenhouse Effect. The basic theory first recognizes that solar radiation is absorbed by the earth's surface, causing it to warm. Much of this warmth is then

re-radiated from the earth towards the atmosphere as infrared light. A portion of this infrared radiation bounces off the atmosphere, trapped, and heats the surface of the Earth further. The crucial idea is that the greater the concentration of greenhouse gases present in the atmosphere, the greater the amount of infrared radiation that is trapped and returns to heat the earth (Strom 10). Greenhouse gases include several natural and man-made gases, such as carbon dioxide, methane, nitrous oxide, and even water vapor. Most scientists have accepted the greenhouse effect for decades.

Of the greenhouse gases – those that are known to increase the atmospheric trapping of heat – carbon dioxide is the most relevant to today’s global warming debate. **Ice-core records** show that atmospheric carbon dioxide levels had been essentially consistent over the 10000 years before the Industrial Revolution that began over 250 years ago in Britain. However, over the last 150 years, atmospheric carbon dioxide levels have risen by about 35% (Strom 14). Most of this excess carbon dioxide was released because of human activities. For example, the forest clearing and coal burning in the Northern Hemisphere from the 17th century released the carbon stored in live vegetation and in coal, which consists of millions-of-years old decomposed vegetation . This was man’s earliest disruption of the ‘**carbon cycle**’, the complex natural process that maintained relatively stable atmospheric carbon dioxide levels by naturally disrupting carbon between the air, oceans and land vegetation.

Beginning in mid-18th century England, the Industrial Revolution set off a chain reaction of industrialization, economic development, and population explosion. Today, this process of modernization still continues to sweep the parts of the world, such as China and India. The factories, vehicles, and mines that have accompanied economic development often use technology which causes heavy pollution, particularly when technology is primitive as it usually is in developing areas. The process of combustion, or the burning of fuels such as oil, wood, coal, and other organic materials, provides energy for vehicles, electricity production, and the industrial and chemical processes of many factories. But the byproduct of combustion is large quantities of carbon dioxide. Indeed, the burning of **fossil fuels** has been the greatest contributor to recent rising carbon dioxide levels. Solid fossil fuels such as coal are the source of 35% of the carbon dioxide emissions from the combustion of fossil fuels. The equivalent figures for liquid fuels such as gasoline is 36%, and for gaseous fuels such as natural gas is 20%. Cement production, which involves the heating of calcium carbonate and thus the release of carbon dioxide, accounts for a further 3% of these emissions. Industrialization has also led to changes in land usage, particularly the clearing of forests to make way for suburban or agricultural uses. This accounts for up to a third of total human-caused carbon dioxide emis-

ice core records- *an accumulation of snow and ice that have re-crystallized and trapped air bubbles from previous time periods. This allows scientists to see what the atmosphere consisted of thousands of years ago*

carbon cycle- *the process by which carbon is circulated throughout the atmosphere modernization – the process of societies developing and advancing towards the Western ideal of prosperity and liberal values*

fossil fuels- *A non-renewable natural resource made formed from decomposing organisms. Important fossil fuels include oil and coal*

sions. The global industrialization process, which is far from complete in the poor and slower parts of the developing world, has resulted in a massive increase in the rate at which carbon dioxide is produced globally.

Carbon dioxide emissions, by their sheer volume, are contributing the most to the ‘enhanced’ greenhouse effect. However, other greenhouse gases released in much smaller volumes are more potent. Methane has 21 times greater impact on temperatures than carbon dioxide over a 100-year period. Slightly over half of the methane entering the atmosphere is released by human activities. The raising of cattle and grazing animals releases large quantities of methane and is the largest single source of anthropogenic methane emissions. Industrial processes and transportation account for the second largest anthropogenic source. Other even more potent greenhouse gases include **chlorofluorocarbons** (CFCs), which have now been banned in most countries, and nitrous oxides released from fertilizers and agricultural processes.

Excess anthropogenic greenhouse gas emissions mean that the sources of atmospheric carbon dioxide now exceed the sinks, and the current rate of increase of atmospheric carbon dioxide is 10% every 20 years. The complexity and sensitivity of the Earth’s climate system and the greenhouse effect means that this is a serious cause for concern. In 1896, the Swedish chemist Svante Arrhenius conducted experiments related to the greenhouse effect and hypothesized that a doubling in atmospheric carbon dioxide levels would result in a 5% increase in average surface temperatures (Strom 11). Arrhenius’ estimate is very close to current theoretical estimates of the relationship between change in carbon dioxide levels and change in global temperatures.

In the decades after the 1950s, the body of data on global temperatures and climate expanded so that long-term trends could be determined with greater confidence. According to Robert Strom, global temperatures have increased by 0.6°C over the past 30 years, and by a total of 0.8°C over the past century. While this may seem like a small change, the sensitivity of the climate system means its consequences are already being recognized. In the 155 years preceding 2007, 10 of the 11 years that recorded the highest average global temperatures ever have occurred between 1995 and 2005. There are many other indicators of a changing climate. Since the 1960s, the extent of snow cover has decreased by about 10%. Average global sea levels rose about 20cm during the 20th century, due to the melting of glacial ice and the expansion of water caused by higher ocean temperatures. Droughts have become more extreme, and precipitation in some regions has become much heavier. Heat waves and tropical cyclones are becoming more intense, as a result of higher global temperatures. Furthermore, scientists have documented climate-induced changes in more than 420 physical processes and biological ecosystems.

chlorofluorocarbons—*any of several volatile, inert, saturated compounds of carbon, fluorine, chlorine, and hydrogen: used as refrigerants, foam-blowing agents, solvents, and, formerly, as aerosol propellants until scientists became concerned about depletion of the atmospheric ozone layer*

Global warming as a theory was accepted by virtually all scientists and by all major scientific bodies well before the **IPCC First Assessment Report of 1990**. But the issue of contention is the cause of global warming, whether humans are responsible for global warming and whether it is even possible to slow down the climate change process. This remains a particularly controversial question, which political actors often attempt to answer with negligible understanding of the science of global warming. Knowledge of the greenhouse effect, coupled with humanity's high emissions of greenhouse gases and the proven rise in global temperatures, leads easily to the inference that human activity is in large part the cause of global warming. This has been the IPCC's position since its First Assessment Report (1990).

Since 1990, thousands of studies have been published concluding that global temperatures are rising and climatic patterns are changing. An analysis by Naomi Oreskes (2004) of 924 abstracts published in peer-reviewed scientific journals determined that 75% supported the consensus position that global warming is real and is being caused primarily by human activity, while 25% took no position on the issue. Incredibly, none of the reviewed abstracts disagreed with the consensus position. This is not representative of the current debate, however, as a number of scientists still dispute the idea primarily anthropogenic greenhouse gases cause that global warming. A common counter-argument made by skeptics is that climate fluctuations and global temperature changes are natural occurrences throughout geological history, so the apparent correlation between an increase in anthropogenic greenhouse gases and a rise in global temperatures does not imply causation but simply coincidence. The skeptics are definitely a minority when it comes to the topic of human-induced climate change. The Fourth IPCC Assessment Report (2007) concluded 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] concentrations" (IPCC 4).

IPCC First Assessment Report of 1990-
This was the Intergovernmental Panel on Climate Change's first published report

Explanation of the Problem

The future prospects for the world's climate are sobering to consider. According to the UN Framework Convention on Climate Change (UNFCCC), "Even the minimum predicted shifts in climate for the 21st century are likely to be significant and disruptive." The minimum predicted increase in global temperatures over the 21st century is more than twice that measured through the 20th century. This is partly because greenhouse gas emissions are expected to continue to rise over the next few decades, due in particular to industrial and economic development in developing countries, such as China and India. But even if the impos-

sible goal of cutting greenhouse emissions to zero could be achieved, global warming has momentum and would continue for decades because of previous emissions. According to Strom, a global temperature increase of 0.6-1°C, with serious consequences, is probably inevitable no matter what action is taken.

But the worst-case scenarios envisioned by the IPCC and climate experts predict far more terrifying consequences. These ‘business as usual’ scenarios assume that industrialization continues on its natural path and active measures are not taken to combat the release of greenhouse gases. The IPCC, in its 2007 Fourth Assessment Report, constructed six possible climate change scenarios with various assumptions and predicted the outcomes with supercomputer modeling. The most extreme estimate of global temperature change is around 4°C although greater increases are not ruled out. This would have catastrophic consequences for the Earth’s climate, economies, and societies. Some believe it could even cause the end of human civilization.

The effects of global warming are bound to make the world less livable and economically viable for humans. Sea levels will continue to rise throughout the 21st century; the most and least optimistic estimates for sea level rise by the 2007 IPCC Report are 0.18m and 0.59m respectively. Rising sea levels could lead to massive destabilization, migration, and huge economic losses from cities and productive agricultural areas. If nothing is done to offset increases in greenhouse gas emissions, the least optimistic estimate of a 0.59m sea level rise may be realized, which would have devastating effects on coastal areas, small island nations, and low, easily-flooded regions such as the deltas in China and Bangladesh. The greater the rise in sea levels, the more farm land that will be destroyed and the greater the number of ‘**climate refugees.**’

More extreme weather events are also predicted, with intensity proportional to the increase in global temperatures. Droughts are expected to be more intense. Precipitation is expected to decline in some areas, drying areas such as the Sub-Saharan Africa, the Mediterranean, parts of Southern Asia, and the grain belt of the US. This will have massive negative impacts on food supplies in these regions. At the same time, precipitation is expected to rise in other areas, risking mass flooding, heat waves and tropical cyclones, which can seriously affect economic activity and cause loss of life and crop depletion. The impact of climate change on biodiversity and ecosystems will depend strongly on the magnitude of global warming. As climate change affects wetlands, forests, and other habitable areas, most of the world’s endangered species – around 25% of mammals and 12% of birds – may become extinct within the next few decades. This would disrupt whole ecosystems and human livelihoods. Furthermore, climate change is expected to have the greatest effect on poor people in the developing world. Models also predict that crop yields could decline between by up to 27%, causing mass

climate refugee—
people forced to leave cities and villages as a result of climatic changes

starvation and obliterating economies and societies (Strom 214). Tropical diseases such as malaria, dengue fever, and sleeping sickness are likely to spread, potentially even to the populations of North America and Europe.

Fortunately, the seriousness of these negative and destabilizing effects depends on the magnitude of global warming. Therefore, by having the capacity to change the amount of greenhouse gases released into the atmosphere from economic activity, humans have some degree of control over the future of the climate and over their own futures. But for action to be taken, people and governments must admit to and understand the effect that greenhouse gas emissions have on the climate.

There is increasing acceptance among citizens and politicians around the world of the idea of human-induced climate change. This may be partly attributed to the ever-growing body of studies that point to a correlation between increasing levels of greenhouse gas emissions and gradually rising global temperatures, melting ice caps, intensifying weather patterns, and other relevant atmospheric signals. Also, the popularization of books, scientific reports, news articles, and documentaries (such as Gore's "An Inconvenient Truth") are expanding people's understanding and awareness of climate change and indicates the growing concern people have about the future. People are becoming more conscious of the moral implications of climate change. There has been a shift, even among businesses, towards reducing and **offsetting** greenhouse gas emissions. These trends in public opinion, like the trends in meteorological data, have been recognized by governments, which are becoming keener to address the issue. This is important, because debate and policy changes related to greenhouse gases cannot take place without the attention and interest of governments.

The Kyoto Protocol

The Kyoto Protocol was the first major international action taken by governments to combat the release of the anthropogenic greenhouse gases that scientists blame for causing global warming. The Kyoto Protocol, negotiated in 1997 and which came into full effect in 2005, specifies a target of 5.2% reduction in greenhouse gas emissions from industrialized countries between 1990 and 2012. It is linked to the 1992 United Nations Framework Convention on Climate Change (UNFCCC), and its goal is to achieve a "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC). The difference between UNFCCC and the Kyoto Protocol is that while UNFCCC encouraged countries to stabilize emissions, the Kyoto Protocol committed them to do so.

offsetting – paying money to an agency to prevent a certain level of carbon emissions being produced

The Kyoto Protocol was designed with a set of five principal concepts in mind:

1. Commitments: The force of the agreement lies in **legally binding targets** for the highly developed ‘Annex I’ (industrialized) countries, and general commitments for other members.
2. Implementation: Policies and measures to reduce greenhouse gas emissions must be designed by Annex I countries. Credits to emit more gases will be given to countries that utilize the three mechanisms available.
3. Minimizing impacts of climate change on developing countries by donating to an adaptation fund.
4. Accounting reporting, and review of the protocol.
5. Compliance: Enforcing compliance with commitments under the treaty, through a compliance committee.

In addition to these agreed-on principles, the Kyoto negotiations led to the idea of a set of “common but differentiated responsibilities.” This meant that different countries were given different emissions targets, reflecting a) their contribution to historical and current global emissions, b) their per capita emissions, and c) their current level of development and future prospects for industrialization. The Kyoto Protocol places a heavier burden on industrialized countries for three key reasons. First, because it was these countries that produced most of the greenhouse gases emitted over the past few centuries. Second, these countries currently have high per capita emissions, and third, as these countries are already rich and do not have to make large sacrifices in terms of future development to reduce emissions. This avoids the unfairness of constraining the development potential of the poorer countries with binding emissions targets. Thus developing countries such as China and India were not given strict targets for emissions. But there are differences even between the rich world countries. The EU target for emissions reduction by 2012 is 8%, for the US it is 7%, for Japan it is 6% and for Russia it is 0%. Increases in emissions were also permitted for Australia (8%) and Iceland (10%), which are developing certain energy industries.

In addition to the targets it specifies, the Kyoto Protocol also designed and set up three ‘flexible mechanisms’ to be utilized by the Annex I nations to help them achieve their commitments. The first of these is Emissions Trading, a scheme that binds countries to an economically efficient **cap-and-trade system** of emissions permits. The second mechanism is the Clean Development Mechanism (CDM), an arrangement that allows countries to invest in projects that reduce emissions in developing countries, as an alternative to the more expensive and less efficient investments that could be made in their own countries, to reduce emissions. The third mechanism, Joint Implementation (JI), allows partnerships between two countries with emissions reductions targets, in

legally binding targets- *Goals that have legal repercussions and penalties if not met*

which one country invests in cheaper emissions reduction projects in the other.

The urgency of discussing a successor to the Kyoto Protocol is due to the fact that the treaty expires in 2012. As of mid-2009, no successor treaty had been negotiated. Considering the many years that the Kyoto agreement took to negotiate (completed in 1997), to have signed (by 1999), to have ratified in different countries (achieved in 2004 with Russia's ratification), and then to become legally binding (by 2005), sufficient time ought to be left for the successor treaty to come into force. If the international community cannot negotiate a new treaty, governments will no longer have heavy incentives to reduce emissions, to which they have grown accustomed. Recent progress may be lost, and future progress will surely be lower. The catastrophic predictions of the business-as-usual climate models may be realized.

cap-and-trade system—*approach to emissions control by providing a set number of rights to emit and then allowing the market to allocate these rights accordingly*

Recent Developments

The Bali Conference

The 2007 Bali Conference on emissions reductions had mixed success, although commentators have argued that no significant progress on a post-Kyoto treaty was made at all. The EU originally proposed targets for a peak in global emissions around 2020. They also called for emissions by developing countries to fall by more than half of the 2000 level by 2050, by developed countries to fall by 20-40% below 1990 levels by 2020. However, strong opposition to these targets particularly from the US, Japan, Australia and Russia, resulted in a compromise simply mandating “deep cuts in global emissions.” This was a poor result that did not create the target incentives that are important motivators for national governments to implement anti-emissions policies.

The Copenhagen Conference

The next major conference that will discuss a successor to the Kyoto Protocol is taking place in Copenhagen in December 2009. The proceedings of this conference must be followed closely, as the goal of the conference is to actually adopt a successor to the Kyoto Protocol. If a successor is adopted, the G8 ought to discuss the treaty and determine a general position on it, perhaps attempting to modify any provisions that it does not support. If no successor is adopted, the G8 ought to consider what it would want and accept in a successor treaty so that these ideas could be proposed at a future climate change conference.

Focus of Debate

The effectiveness of the Kyoto Protocol derives from the fact that it is a widely recognized, binding treaty. It has concrete goals, strict monitoring measures, and strong international support (184 countries have ratified the treaty). Although there is a debate over the successfulness of the treaty, and despite only a handful of countries being on track to realize their emissions reductions targets, without the treaty there would be significantly fewer incentives for countries to reduce their greenhouse gas emissions. Political leaders are keen to show their support for reducing carbon emissions and so are generally in favor of signing on to treaties. Once treaties are ratified, the desire to keep political promises and to maintain a good international reputation means that governments face steep costs of not complying with treaties. The binding nature of the Kyoto Protocol, which punishes countries that do not reach their targets by requiring them to make up the difference plus 30% by a future date, increases these **non-compliance costs**. Thus international treaties can be effective at getting governments to reduce greenhouse gas emissions.

A new treaty should build on the Kyoto Protocol and exceed it in effectiveness. The Kyoto Protocol was criticized from many different quarters. One point of concern was that the sum of the individual targets for emissions reductions was well below the progress that would need to be made to prevent the catastrophic consequences of climate change. According to Strom, even if the Kyoto targets were met, “it would still be woefully inadequate to do anything but barely slow down global warming” (234). Another criticism of the Kyoto Protocol, which was heard particularly from the Bush Administration, is that it does not restrict emissions from developing countries such as China, the world’s largest emitter. However, during negotiations it was decided that it would be unfair to restrain the development of these countries, since they contributed little to greenhouse gas emissions historically, and because rapid development was the route to prosperity for billions of the relatively poor. There are other criticisms of the treaty, including the fact that its **enforcement** mechanism is not effective or punishing enough to force countries to reduce emissions.

NGO Perspectives

Greenpeace International

Greenpeace International is an environmental campaigning organization that aims to expose environmental destruction and advocate for solutions that help to protect natural resources. Greenpeace operates in a peaceful and non-violent manner to confront politicians, international organizations, and companies. This, the organization believes, helps to raise the level and quality of public debate about environmental

non-compliance costs—costs associated with defecting from agreements

issues. Greenpeace operates with financial independence from political and commercial interests.

Greenpeace believes that climate change poses an enormous threat to the environment and to the world's people. The organization blames corporations such as oil companies for contributing to the problem and opposing measures that will reduce carbon emissions, as well as some politicians for failing to support solutions to global warming or outright denying that the process is occurring. Greenpeace's global warming campaign focuses on the promotion of an "Energy Revolution" that will combat carbon emissions through a three-step approach to energy use and production: improving electrical efficiency, decentralizing power generation and using large-scale renewable resources such as sun, wind, or geothermal, and finally, improving the efficiency of transport systems.

Greenpeace's scientists say that politicians must ensure that emissions peak by 2015 and decrease towards zero after that. Greenpeace also suggests that developed countries make 40 percent cuts on their 1990 emissions by 2020, and that developing countries, with support from the rich world, ought to slow the growth of emissions by 15-30 percent by 2020. A special funding mechanism for protecting tropical forests has been proposed, along with the obvious solution of replacing carbon-emitting fossil fuels with renewable energy sources. Greenpeace rejects the assertion made by some groups concerned about climate change that non-carbon-polluting nuclear energy ought to be widely adopted, since this has other environmental effects due to nuclear waste.

enforcement – *measures taken to ensure a party to an agreement abides by that agreement; punishment to non-compliers*

The Heritage Foundation

The Heritage Foundation is a conservative American **think-tank** established in Washington, DC in 1973. It has had significant influence in the making of American public policy, particularly during the conservative administrations of Ronald Reagan and George W. Bush. The Heritage Foundation's research and proposals include the belief in small government, free markets, individual freedom, "American values", and a strong national defense. The opinion of the Heritage Foundation matters worldwide because of its large following and its influence within America on foreign policy.

The Heritage Foundation believes that demand for oil is increasing faster than supply, and therefore that America must increase its capacity for oil production and purchasing. While this policy would probably be better for the economy in the short run, as the Heritage Foundation claims, it is likely to increase the amount of carbon emissions. The organization, however, does not consider global warming to be a serious and urgent problem, arguing that "... many Americans harbor misunderstandings and myths about energy, the environment, and market forces." The Heritage Foundation says that, as a result, Congress enacts

“conflicting policies” that harm the nation’s ability to meet its energy needs.

The Heritage Foundation is highly critical of any proposed legislation that seeks to limit carbon emissions by increasing their cost to industries: “most plans have huge costs and questionable benefits.” It advocates for solutions to energy problems that from the private sector, rather than reliance on mandates, regulations, directed research, and subsidies. Such views are in opposition to the idea of carbon emissions trading schemes, which effectively place a tax on businesses for carbon pollution and increase the cost of energy, hurting the economy at least in the short run. The Heritage Foundation heavily criticized the Waxman-Markey Bill passed by the US Congress, saying that it represents an extraordinary level of economic interference by the US Government. It claims that the legislation creates severe, arbitrary restrictions on energy supply that can only be met with the deployment of still-undeveloped or expensive alternative energy sources. The Heritage Foundation argues that the additional costs imposed on businesses would eventually have to be met by the American people.

think-tank—a group whose members research issues and advocate for certain policies

Center for American Progress

The Center for American Progress is a progressive and independent American think-tank. Formed in 2003 as an alternative to more conservative think-tanks such as the Heritage Foundation, the Center for American Progress pioneers policy proposals to “transform our nation and our economy”, with a stated focus on defending the global environment, advancing global prosperity, and promoting sustainable energy sources. The organization helps to innovate new environmental technologies and pragmatic solutions.

One solution that the Center for American Progress strongly supports is the introduction within America (and in other countries also) of a cap-and-trade carbon emissions scheme. Though the implementation of this has been made more difficult because of the economic crisis, the Center for American Progress still supports auctioning 100 percent of the greenhouse gas emission permits, rather than giving away a quarter or half for free, which decreases the cost of carbon emissions and makes the scheme less effective. The Center for American Progress proposes that the revenue created from the auctions of emissions permits would go towards investing in a just and equitable transition to a low-carbon economy. Green technology, energy efficiency, adaptation, green jobs, and sheltering consumers and producers from economic dislocations due to shifting energy prices are all investments supported by the organization.

Possible Solutions

The process of negotiating a successor treaty to the Kyoto protocol is complicated by the unwillingness of many governments to harm economic activity. Greenhouse gas reduction policies are, in effect, an extra tax on businesses, causing their costs to rise and thus their profits and level of production to fall. Economic growth is slowed and that is bad publicity for political leaders, who want to be seen as improving growth and wages. Many countries are hesitant to constrain businesses. Many different national policy mechanisms that can reduce a country's greenhouse gas emissions have been proposed, so governments have some choice over the costs and results of emissions policies. Some of these ideas have already been implemented, usually quite successfully. One primitive scheme involves setting targets for carbon emission reductions for businesses. This is not economically efficient however, because different companies will have different costs of reducing their carbon emissions. **Carbon taxes** directly impose a cost on all the carbon emissions of a company, reducing the incentive to pollute.

The most economically efficient schemes are based on cap-and-trade mechanisms. Cap-and-trade is a market-based approach that allows the trading of permits to emit fixed volumes of greenhouse gases. This increases the cost of polluting but also ensures that the **marginal cost** of emitting one more unit of carbon is equal for all companies. This is the most economically efficient solution, because it means that the companies that can reduce their emissions cheaply will have large reductions, while companies that would have to endure significant losses to reduce their emissions would have lower reductions. By auctioning off a set number of emissions permits, the level of total carbon emissions may be set by the government.

In addition to the cap-and-trade system, the Kyoto Protocol also set up the Clean Development Mechanism and Joint Implementation, explained above. These or similar systems could be modified and included in a successor treaty, if it is found that they are useful in achieving the most efficient reductions in greenhouse gases. The list of emissions-combating policies that could be included in the successor treaty is not limited to those included in the Kyoto Protocol. On an international level, coercive trade policies could be used to discourage countries from consuming fuels that emit greenhouse gases. An international body could reduce trade in fossil fuels by imposing tariffs or import restrictions. This, however, is not a cooperative approach, and it could lead to disputes between countries and the destruction of the trust and mechanisms needed to pressure countries to reduce emissions. A more reward-oriented approach would create positive incentives for investing in research and technology that can reduce greenhouse emissions, such as more efficient fuel cells for vehicles, carbon sequestration techniques, or

carbon taxes- an environmental tax that correlates with carbon emissions

methods for extracting carbon dioxide from the atmosphere. Many other possibilities abound. Whatever approaches ought to be taken, positive or negative incentives for reducing emissions must be an element.

Questions for Policymakers

In proposing their own ideas for a successor treaty, the Group of Eight must determine what priority to place on greenhouse gas reductions. Policies that constrain businesses from freely emitting greenhouse gases impose an economic cost which is likely to reduce economic growth in the short-run. But, as the 700-page Stern Report on the economic effects of climate change concluded, whereas the costs of investing now to reduce greenhouse emissions may be 1% of GDP, but impact of inaction could be worth up to 20% of global GDP in the long-run.

The Group of Eight should also consider whether and how to set emissions **targets** for different countries. Targets provide a benchmark for success and a solid goal for motivation, but they are often not achieved and must be set quite arbitrarily. Furthermore, different countries hold different ideological views, priorities, and self-interests. Thus, they will always be looking for justifications to keep their own target low and those of others high. The policy of the Bush Administration, which refused to ratify the Kyoto Protocol, was to oppose the high emissions reduction target for the US while supporting a much higher target for China. The counter-argument put forward by developing countries such as China is that this would severely constrain their industrialization processes, and since they are responsible for a small fraction of historical greenhouse gas emissions, this would leave them with a burden they do not deserve.

In addition, the Group of Eight must also consider how the emission targets should be implemented. The Kyoto Protocol makes countries legally bound to reduce their emissions. The Group of Eight must decide how they will either offer incentive to countries or consequences for those countries that do not meet their emission requirements.

The policy in the final treaty, which may or may not include concrete country targets, will require intense negotiations and heavy compromises between the industrialized and developing nations.

Conclusion

Climate change is one of the most politically controversial global issues today. Different governments at different times have divergent views on the seriousness of global warming, its causes, and what sacrifices ought to be made to prevent it. As a result, it is impossible to form a treaty that will satisfy everyone. Bargains must be made, since it is

marginal costs- *the change in the total cost when the quantity of a good is increased by one*

important to have all countries on board in the fight to reduce carbon emissions. The task that lies before you – the representative of your nation in the Group of Eight plus Five will therefore require understanding and judgment, as well as the ability to compromise when necessary. This is how you can achieve the most favorable outcome in the interest of your country.

targets—*differentiated levels of emissions, assigned to each country*

Guide to Further Research

There are numerous books and websites that present information about global climate change, carbon pollution, and emission reduction schemes and their economic effects. However, because global warming is such a controversial and scientifically hard-to-prove phenomenon, many sources present opinions rather than facts, or interpret facts in ways that favor their own views.

The Intergovernmental Panel on Climate Change is perhaps the most respected source of climate change research, science, and policy proposals. This UN-affiliated body, made up of scientists from around the world and which is relatively politically independent, has concluded with a very high level of confidence that global warming is occurring and that it is primarily caused by anthropogenic carbon emissions.

Most governments have issued policy statements about climate change and analysis of various policies intended to combat emissions. However, since different political parties within the same country may have radically divergent views on global warming and appropriate policy responses, policy statements issued by governments ought to be treated with some suspicion, and it must be recognized that with the changing of a government may bring a complete overhaul of climate change policy. It is therefore important to find credible, balanced sources and a mix of opinions on the issues.

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