

global issues

APRIL 1997, VOLUME 2, NUMBER 2

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CONFRONTING



CLIMATE  
CHANGE

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*We must work to reduce harmful greenhouse gas emissions. These gases released by cars and power plants and burning forests affect our health and our climate. They are literally warming our planet. If they continue unabated, the consequences will be nothing short of devastating for the children here in this audience and their children.*

***President Bill Clinton***

*Remarks at Port Douglas Park,  
Australia, November 22, 1996*



# WHY WE SHOULD CARE

**If countries around the world do not reduce emissions of greenhouse gases by the end of the next century:**

\*

**Temperatures will have increased between 1 and 3.5 degrees Celsius, depending on population and economic growth.**

\*

**Sea level will be 15 to 90 centimeters higher than now, with the best estimate being 50 cm, threatening 92 million people each year with floods by the year 2100.**

\*

**Mortality and illness will have risen as the intensity and duration of heat waves increased and as the tropical habitat of mosquitoes that carry malaria and dengue fever crept northward.**

\*

**Rainfall will have decreased in some tropical and subtropical areas and increased in others, significantly reducing food crops in developing countries as a whole.**

*The source for these estimates is the Intergovernmental Panel on Climate Change (IPCC), made up of more than 2,000 scientists worldwide, whose work is strongly supported by the Clinton administration.*

*This Global Issues journal concentrates on the U.S. proposal to strengthen the current climate change convention by requiring developed countries to reduce greenhouse gas emissions early in the next century. It also calls on developing countries to make reductions in the future.*

*Almost all countries would be greatly affected by attempts to reduce greenhouse emissions because they are produced by the burning of the major fuels of a modern economy — coal and oil, which forms carbon dioxide. In developing countries, rotting rice paddies and certain animals give off methane, a potent greenhouse gas.*

*Efforts to revise the current climate change treaty began last year and the contentious talks are scheduled to conclude in December in Kyoto, Japan. Developed countries are divided over how much to cut greenhouse emissions and when. Many oil-producing countries oppose reductions. And many developing countries agree to treaty revisions only if the industrialized nations have to make reductions.*

# global issues

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## GLOBAL ISSUES

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# FOCUS



## U.S. Policy on Climate Change

*Excerpts of remarks by Timothy E. Wirth, under secretary of state for global affairs, before the Second Conference of the parties to the Framework Convention on Climate Change, Geneva, Switzerland, July 17, 1996.*

Our deliberations have benefited from the careful, comprehensive, and uncompromised work of the Intergovernmental Panel on Climate Change (IPCC), whose efforts serve as the foundation for international concern and whose clear warnings about current trends are the basis for the sense of urgency that my government holds in these matters. We are not swayed by, and strongly object to, the recent allegations about the integrity of the IPCC's conclusions. These allegations were raised not by the scientists involved in the IPCC, not by participating governments, but rather by naysayers and special interests bent on belittling, attacking and obfuscating climate change science. We want to take this false issue off the table and reinforce our belief that the IPCC's findings meet the highest standards of scientific integrity.

In the ongoing scientific effort, I want to note that the United States is proud of the more than \$1,000 million annual investment it has been making in recent years on global-change research. This is a cost we have taken on in order to enhance our own and the world's understanding of the Earth's atmospheric, oceanic, and biological systems and represents not only the seriousness with which we view these matters, but also the willingness of President Clinton and the American people to help pioneer progress on behalf of the environment.

The United States of America takes very seriously the IPCC's recently issued Second Assessment Report.... The most salient of these findings are as follows:

□ The chemical composition of the atmosphere is being altered by anthropogenic emissions of greenhouse gases;

□ The continued buildup of these gases will enhance the natural greenhouse effect and cause the global climate to change.

Based on these facts and additional underlying science, the second assessment reported that "the balance of evidence suggests that there is a discernible human influence on global climate." This seemingly innocuous comment is in fact a remarkable statement: for the first time ever, the world's scientists have reached the conclusion that the world's changing climatic conditions are more than the natural variability of weather. Human beings are altering the Earth's natural climate system.

In turn, the best scientific evidence indicates that human-induced climate change, if allowed to continue unabated, could have profound consequences for the economy and the quality of life of future generations:

□ Human health is at risk from projected increases in the spread of diseases like malaria, yellow fever, and cholera;

□ Food security is threatened in certain regions of the world;

□ Water resources are expected to be increasingly stressed, with substantial economic, social, and environmental costs in regions that are already water-limited, and perhaps even political costs where there is already conflict over limited resources.

□ Coastal areas — where a large percentage of the global population lives — are at risk from sea level rise.

In our opinion, the IPCC has clearly demonstrated that action must be taken to address this challenge and that, as agreed [at negotiations in 1995] in Berlin, more

needs to be done through the [current climate change] convention. This problem cannot be wished away. The science cannot be ignored and is increasingly compelling. The obligation of policymakers is to respond with the same thoughtfulness that has characterized the work of the world's scientific community.

Unhappily,...the most salient fact is now more apparent than ever: the current convention structure has not achieved the results that were anticipated and planned for in good faith — few nations in either the developed or developing world have been fully successful in meeting their commitments [to reduce greenhouse gas emissions to 1990 levels by the year 2000]....

Over the past year, the United States has been engaged at home and internationally in serious analysis of the successes and failures of the current convention structure, as well as of the practicality of the various proposals for next steps that have been put forward in recent discussions. While we still have much work to do, our analysis and consideration of this issue to date have led us to certain conclusions about the form of an agreement we hope these negotiations will consider and pursue. In the months ahead, our ongoing analysis and assessment will allow us to more precisely articulate the specific contents that the United States could support.

We begin from the following base set of principles, which will guide our consideration of proposals and which we believe should guide our multilateral negotiations:

First, our negotiations must focus on outcomes that are real and achievable. Sound policies pursued in the near term will allow us to avoid the prospect of truly draconian and economically disruptive policies in the future. Measured adjustments now and in the years ahead will enable all nations to reduce emissions in an economically sensible manner. Denial and delay will only make our economies vulnerable in the future.

Second, the United States will continue to seek market-based solutions that are flexible and cost-effective. We will not accept proposals that are offered for competitive, not environmental, reasons. Serious proposals in the future must not be thinly veiled attempts to gain economic advantage. This is a global problem with global impacts and therefore requires solutions that are fair, and that will ensure prosperity — now and in the future — for all the world's people.

And third, the agreement should lay the foundation for continuing progress by all nations in the future. The United States believes that international cooperation on this challenge remains critical to any effective response and that all nations — developed and developing — must contribute to the solution to this challenge. We believe that, while this is a long-term challenge, we must start making progress now and engage the public and private sectors over the medium-term as well. Climate change is a serious problem and will require sustained long-term investment and the full creativity of the marketplace.

President Clinton has urged all Americans and all nations to prepare their economies for the 21st century. Meeting this challenge requires that the genius of the private sector be brought to bear on the challenge of developing the technologies that are necessary to ensure our long-term environmental and economic prosperity.

Based on these principles...the United States recommends that future negotiations focus on an agreement that sets a realistic, verifiable and binding medium-term emissions target. We believe that the medium-term target must be met through maximum flexibility in the selection of implementation measures.... In addition, our view is that it will be necessary to continue working toward a longer-term concentration goal [of greenhouse gases in the atmosphere for the next 50-100 years], as set out in the convention's objective, recognizing that scientific understanding and technology will improve over time. Working toward such a goal would better establish the long-term, global nature of the problem.

Having outlined in broad terms the basic components of an agreement we could support, I want to underscore the expectation of the United States that the agreement be realistic and achievable. Our preliminary analysis of the targets that have been tabled for consideration to date suggests that these proposals are neither realistic nor achievable — either because they would compromise other important principles, such as the need for flexibility in time and place of implementation, or because they involve timeframes and objectives that are not consistent with national and international prosperity. Our job in the months ahead is to search for agreement on a next step that will produce results that are consistent with our environmental and economic aspirations.

Others have suggested that the negotiations move toward consideration of some ambitious mandatory,

internationally coordinated policies and measures. In particular, suggestions are emerging for annexes to the agreement outlining specific actions that relevant parties would be required to undertake, such as, for example, agreed fiscal or regulatory policies.

In our view, the significant differences in national circumstances and individual national approaches to these matters suggest that few, if any, individual measures are likely to be applicable to all countries. Therefore, as a general proposition, the United States opposes mandatory harmonized policies and measures. We are open to the possibility of exploring consensus on agreed procedural measures, for example those that might be necessary to implement an international trading regime [in the sale and purchase of allowances to emit greenhouse gases] or ensure enhanced reporting.

Finally, I want to discuss a difficult component of the negotiations, but one that is essential if we are to make progress over the long term. The United States is committed in these negotiations to ensuring that all countries — developed and developing — take steps to limit emissions, consistent with the mandate agreed upon last year in Berlin. We look forward to working together to develop strategies for advancing implementation of this convention. While we recognize that developed countries have the responsibility to lead, we also believe that this effort must be a partnership with all nations. We stand ready to continue our efforts to provide technical expertise to work with developing countries to reduce greenhouse gas emissions, and to continue the partnership which we have begun with many.





## Every Country Has To Help

*An interview with Robert Wolcott, deputy assistant administrator for policy, planning and evaluation for the Environmental Protection Agency*

*Since the industrial revolution began more than a century ago, industry and consumers in the developed countries have been the largest sources of the greenhouse gases that are warming Earth and affecting its climate. But some of the rapidly industrializing developing countries will become the major greenhouse emitters in the next century. The role of all countries in helping to curb greenhouse gas emissions is being hotly debated in international negotiations scheduled to conclude in December on whether to stiffen provisions of the current international treaty to prevent global warming. Wolcott was interviewed by Jerry Stilkind, managing editor for this issue of Global Issues.*

**Question:** The U.S. proposal for revision of the climate change treaty is asking developing countries to begin limiting greenhouse gas emissions. Why? Isn't it the developed countries who created this problem?

**Wolcott:** Developing countries haven't created the problem, but we're all in this together because ultimately we will all experience the adverse effects of a century of increased, man-made greenhouse gas emissions. Clearly, we in the developed world are responsible for the vast share of emissions to date and, in that sense, responsible for near-term damages that can be identified from it.

As we look, however, into the future, the emergent economies of the world are going to be growing much more rapidly in terms of greenhouse gases than the developed world, and I believe we and they have to step forward arm in arm to determine the most intelligent, least-cost way to limit emissions and limit the damages that are associated with them.

The key point here is that emissions of developing countries are and will be increasing at a far more rapid rate as they move through what you could think of

almost as a corridor of technologies. They will be adopting technologies that are more or less currently in place or have recently been in place in the developed world.

So we feel that the United States and the rest of the developed world need to step forward as partners with these emergent economies to reduce these emissions in an economical way with the most advanced technology that those economies can use.

**Q:** The U.S. proposal to revise the climate change treaty will be one among many to be considered this year during international negotiations scheduled to end in December in Kyoto, Japan. The current treaty only encourages developed countries to return emissions to 1990 levels by the year 2000. What changes would the U.S. proposal make?

**Wolcott:** The United States is looking for medium-term, that is 2010 to 2020, timetables for beginning to reduce greenhouse gases. We're looking for an international agreement that is legally binding, not just another set of goals. We're looking for a system that would be highly flexible and cost-minimizing in reducing emissions and that could foster a sustained rapid improvement in the technological base that would make all this possible.

**Q:** Have you proposed reduction timetables for developing countries?

**Wolcott:** We don't propose that developing economies receive and adhere to emissions "budgets" in the near-term. Developed countries, including Russia and the rest of Eastern Europe, called Annex 1 countries in the current Framework Convention on Climate Change, should be required to reduce emissions to a certain level. They would have emission budgets.

Over time, developing countries should look forward to graduating into that budget status, but in the near-term we're not looking to the developing world to receive and to achieve budget levels.

Also for the near-term, we advocate a climate technology transfer program in which we will join with our developed-world partners to supply the most advanced and appropriate technology to emergent economies to facilitate their sustained growth economically, but in the least greenhouse-gas intensive fashion.

An important element of technology transfer is what is called “joint implementation” in the Framework Convention on Climate Change. Joint implementation encourages private industry in the United States and other developed countries to invest in projects in the developing world that would substantially improve energy efficiency in the emergent economies or that would store carbon dioxide, the major greenhouse gas, in their biomass, principally forests.

Carbon dioxide is produced by the burning of coal, oil, and natural gas, the major sources of energy in an industrialized economy. Carbon is stored in trees and is released as carbon dioxide when they are cut or burned down. Methane is another potent greenhouse gas and is produced by rotting rice fields covered with water, in the digestive tracts of cows, and in sealed landfills. All of these important sources and storage sinks of greenhouse gases could be reduced or enhanced through joint implementation.

Also in the near-term, we’re looking for paths over which developing countries will put in place the infrastructure that’s required to manage greenhouse gases. And we’re doing that through a Country Studies Program, in which we provide financial support to developing nations to do emissions inventories, for instance. That will give them the basis for measuring what is and what will be coming out of their economic production operations.

In the longer term, meaning beyond 2010, we hope for a gradual embrace of the budget concept and we feel its tremendous advantages will be demonstrated to emergent economies even before that date.

So what we’re trying to do is create a context within which the developing world can participate without having to bear the burden of an emissions budget in the near-term. Much of this simply stems from the realization that the developed world is largely responsible for today’s condition and is far more capable financially and technically to invest in emissions reductions.

**Q:** Isn’t the joint implementation program you’ve just mentioned a part of what is being called a greenhouse-gas emissions trading system? Has the administration detailed how it thinks a system for trading emissions should work?

**Wolcott:** We do not have a highly detailed trading system approach, but I can share with you a number of specifics that I think will give you a fairly good picture of where we’re coming from.

What we envision in the trading system is the following: a world in which an overall objective is specified and that would be expressed in terms of, for instance, greenhouse gas emissions from Annex 1 countries (about 20 developed countries, including Russia and Eastern Europe) not exceeding what they were, for instance, in 1990, which would become the base year.

The amounts that any one party to the treaty would be allowed to emit would be a function of that baseline. So, for instance, we would find if we looked today at total U.S. greenhouse emissions that they are significantly above the 1990 level, largely owing to low relative energy prices and strong economic growth since 1990. But Russia, for instance, had a stronger economy in 1990 than now, so its emissions are significantly below its 1990 level.

Now, once having determined what the budgets are — and that budget, again, might be equal to, below or above that of the base year — a party to the treaty whose emissions are lower in any year than in its budget would be allowed to sell to another participating party the right to emit greenhouse gases. The point of trading is to insure that emissions among participating countries never go higher than the total budget for all of them. And, again, trading would be limited to developed countries at first.

Under this system, the United States would be granted a certain budget based upon this 1990 base year and we would, in turn, grant allowances to U.S. companies emitting greenhouse gas emissions in accordance with what they were emitting in the base year. That is how the international trading system will be inextricably linked to the domestic trading system that we imagine stemming from it.

Under the international system, the Russians or the Czech Republic, for instance, may face significantly lower costs per unit in meeting their budget than the

United States or France or Germany. Under such a circumstance, a corporation in the United States might contract with specific sources in those countries to buy, if you will, rights to emit greenhouse gasses.

Now, the focus will be on carbon dioxide, but we're including all greenhouse gases in our proposal, including methane, provided they can be accounted for accurately and reliably.

Frequent, accurate reporting of emissions will be critical. For example, each year we would report on what our greenhouse-gas emissions were, and conceivably there could be borrowing from the future, but at a significant "interest" cost. And every several years, we would create new base years and budgets.

You might logically ask how does this link up with joint implementation, how can the Ecuador and the Bolivias and the Thailand in the world participate in this system?

Well, eventually, these countries are going to experience sustained economic growth and that will lead them to participate in this formal control and trading system. But in the meantime, Annex 1 countries or investors within those countries could join with emergent economies to produce energy efficiency gains within the developing countries or to increase the storage of carbon there, in new forests, for example. Under the U.S. proposal, where these joint projects can be monitored and verified in a highly rigorous way, the credits received by investors in developed countries could be used like the other credits in the trading system.

Remember, reducing the greenhouse gases per unit of production would be significantly less expensive in Bolivia, for example, than in the United States. This creates an incentive for a U.S. company to minimize the cost per unit of greenhouse-gas reductions by investing in an electric power plant in Bolivia rather than in the United States. Developing countries then will have a powerful and profitable role to play in this system as they gradually move towards the international objective of reduced emissions.

**Q:** Then the joint implementation project with the Guatemalas, the Thailand, the Bolivias, the Indonesias would mean that a U.S. utility, for example, would invest in improving the technology of a utility in one of these other countries. The utility in the developing

country might have to spend something to upgrade its power plant, but a large part of the upgrade in technology would be an investment by a U.S. company.

**Wolcott:** That's correct. And then it's up to those two parties to determine what the relative shares of ownership are of that credit. Now, if a utility in the United States puts up all of the funding, then you would expect it to claim a significant fraction of the value of the credit. On the other hand, the firm or the NGO within that country clearly has expended time, has expended some resources, as you suggested, and wants to realize some benefit itself. Again, that is between the parties.

I think another point that's important to emphasize here is that the benefits that derive from this joint implementation system aren't strictly confined to greenhouse-gas emissions and resultant damages. If we place 50,000 hectares of land into a much better managed state, we are improving water quality, we're producing habitat that could be crucial for the survivability of critical species. These are benefits beyond simply greenhouse-gas reductions. So, I think it's important also to look at that, what we call spillover benefits.

**Q:** But developing countries are not enthusiastic about a joint implementation program. Does that extend to the notion of an emissions trading system? What are the objections of developing countries to one or both?

**Wolcott:** There seems to be a spectrum of concerns in the developing world regarding joint implementation. Some part of the developing world views joint implementation programs as a form of carbon colonialism whereby large U.S. and developed world investors go into a country and buy up the cheapest greenhouse-gas reduction projects. These developing countries fear limits on their capacity to grow in the long run if all they are left with are higher-cost ways of controlling emissions.

I think even more generally they feel that this puts them under the influence of, and even control of, investors from the developed world.

Some, if not many, in the developing world view this as an opportunity to produce and market relatively low-cost carbon management projects and to also operate in a truly sustainable development fashion by, for example, reforesting portions of their land base. They see that they would be compensated for economically

efficient projects and also realize sustainable yields from reforestation programs. Costa Rica is an excellent example of this.

Costa Rica, a leader among developing countries on environmental issues, has very actively participated in our pilot program, and NGOs within that country are some of the leading lights of the international environmental community.

**Q:** Tell me about the joint implementation pilot program?

**Wolcott:** We have had a pilot program since 1994. Under this program, opportunities are identified within a variety of nations to improve energy efficiency and thereby greenhouse-gas related efficiencies.

Typically, what happens is a party, either an NGO in one of those countries or an NGO in concert with an investor in that country, will bring that project to the U.S. secretariat for critical review to determine whether those emissions reductions or storage improvements are verifiable, are real.

Right now, there are 23 projects that have been approved by the evaluation panel. I believe five are actually up and running. I believe two or three of those are in Costa Rica. And there are a variety of efforts underway right now to evaluate how this process has been conducted and how well the projects themselves are working out.

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*Jerry Stilkind writes on the environment and other global issues for the United States Information Agency*



# The Heart of the U.S. Proposal

*International efforts to revise the U.N. Framework Convention on Climate Change to prevent large-scale damage to Earth have been ongoing. They are scheduled to end December 1997. Here is a summary of the proposed U.S. revisions, presented in March 1997 by Ambassador Mark Hambley, chief U.S. representative to the treaty negotiations.*

In July 1996,...the United States outlined a broad framework for negotiation of next steps under the U.N. Framework Convention on Climate Change (UNFCCC). In January 1997, we submitted a further elaboration and fleshing out of our proposed framework.... We noted that this was being done without prejudice to the final form of the proposed agreement, which is to guide greenhouse gas emissions reduction efforts in the post-2000 period.

While our text is comprehensive, it is basically predicated on a few core ideas. These include: (a) legally binding emissions targets (which in our view should take the form of an emissions budget); (b) measurement, reporting, and compliance (key to the legally binding character of the agreement); (c) emissions trading and joint implementation (fundamental elements of a flexible and cost-effective regime); (d) continuing to advance the implementation of commitments by all parties, developed and developing; (e) long-term efforts under the Convention; and (f) institutions and legal issues. Each of these points is summarized in the following paragraphs.

## **A New Way to Define the Target: Legally Binding Emission Budgets**

Building on the concept of cumulative and averaged emissions, the U.S. proposal establishes an “emissions budget.” An emissions budget is the total amount of greenhouse gases that can be emitted over a period of several years. Multiple emissions budget periods are proposed, including a second period in which emissions are equal to or less than the first period, thus assuring

continued progress toward achievement of the convention’s ultimate objective [of reducing the concentration of greenhouse gases in the atmosphere].

For a given period, each developed country party would be allocated an emissions budget. The budget would be the same for all Annex I Parties (the so-called “developed” countries, including Russia and Eastern Europe, a group we have named as “Annex A” in our proposal).

We have not yet identified either the size of the budgets or the duration of the budget periods. The United States is now actively engaged in an intensive analytic effort to assess what budget level would be appropriate. In this context, we do not believe it is reasonable to set a political target without a concept of how such a target might be met, or what costs can reasonably be expected to be associated with such a target. Annex A emissions budgets would, however, use 1990 as the base year, and would be legally binding.

Parties would be allowed to “bank” for future use emissions not used during the given period. This provision...would allow a party to take more aggressive actions and reduce emissions beyond the level required during one budget period — and save those reductions for use at a future time. In this way, our instrument both provides an incentive to take early reduction actions and offers each party the opportunity to maximize the cost-effectiveness of its own reduction program.

We also believe it is appropriate to allow parties to borrow a very limited amount of emissions (with a penalty) from a subsequent period. The penalty (automatically applied to any borrowing party) provides the first step in a non-compliance procedure. Borrowing also makes it possible for a party to plan its emissions trajectory beyond the established budget period.

In our proposed protocol framework, a new category of parties is proposed to encourage rapidly developing countries to voluntarily adopt emissions budgets. This group has been designated as “Annex B,” and it is proposed that they would have a different budget than that

assigned to Annex A countries. While membership in Annex B would be voluntary, we believe that the benefits derived from membership — including the opportunity to participate in emissions trading [definition below] — will entice some to join.

### **Measurement, Reporting, and Compliance**

The U.S. proposal establishes procedures to ensure adequate measurement, reporting, review, and compliance. We and many others strongly believe that the Kyoto [the last session in this round of negotiations on revising the climate change treaty is scheduled for this Japanese city in December] instrument should take the form of a legally binding agreement. In our view, a binding agreement is only meaningful if it contains appropriate reporting and compliance mechanisms. The proposal calls for Annex A and B countries to set national systems for measuring emissions accurately, achieving compliance, and ensuring enforcement. It also obligates Annex A and B countries to provide annual reports on measurement and compliance and enforcement efforts for the relevant budget period and to make these available to the public. Consequences of non-compliance could include denial of emissions trading/joint implementation rights or the loss of voting and other decision-making rights.

### **Emissions Trading and Joint Implementation**

The U.S. proposal seeks to minimize the costs associated with emissions reductions. To this end, it includes both flexibility in setting the target year (through the use of a multi-year budget), and flexibility through allowing emissions trading and joint implementation. Emissions trading, as described in Article 6 of our proposal, is only allowed between parties that each have budgets and that are in compliance with their measurement and reporting obligations under the agreement. While the private sector may engage in trading (and we expect most trades to take place through private sector activity), the parties themselves retain full responsibility for the emissions traded. Compliance with budget obligations remains with the government.

Because our proposal contains substantial detail on reporting and monitoring obligations for Annex A Parties (required to insure compliance with the budget even in the absence of trading), there need be no additional complex scheme to monitor trades. It

becomes largely an accounting exercise. But the benefits of trading are enormous — [trading] substantially reduces the cost of compliance, and equalizes the incremental cost to all Annex A parties of the next unit of greenhouse gas emissions reductions.

The U.S. proposal also contains provisions for joint implementation. We distinguish joint implementation from emissions trading. In our view, emissions trading should be allowed only between parties with budgets, and would be based on existing reporting and monitoring already required. Joint implementation, on the other hand, would be allowed between parties with budgets and those without budgets (e.g., developing countries). Emissions reductions created through joint implementation projects could then be traded.

### **Advancing Implementation of Article 4.1 [on the Commitments of All Parties]**

Recognizing the importance of global involvement in next steps, the Berlin Mandate calls for all parties — including developing country parties — to be engaged in next steps. Article 4.1 is open ended with respect to policies and measures, calling for all parties to undertake action. While imposing no new commitments, our proposal begins to define these obligations.

For example, our proposal calls for the identification and adoption of “no regrets” measures to mitigate net greenhouse gas emissions. These measures, such as installing energy-efficient lighting systems, have additional benefits including long-term cost savings and reduced local air pollution.

Article 4.1 also sets an obligation for all parties to inventory and report on their emissions. However, neither the timing nor the frequency of these inventories has been set; we suggest that the period be annual, to provide the international community with an accurate baseline for its total emissions levels. Article 4.1 also sets an obligation to review implementation; the U.S. proposal makes more specific the requirements for this process.

### **Long-Term Efforts Under the Convention**

Recognizing that the climate change problem is long-term, and that the effects of our efforts to address it are

uncertain, the U.S. proposal calls for periodic review of the agreement as scientific knowledge and information grows. The U.S. is also convinced that we must ultimately tailor our agreement to the climate change problem — a problem that is measured in terms of increasing atmospheric concentrations of greenhouse gases, not their emissions. To this end, we include, in Article 9 in our proposal, an obligation to cooperate in the establishment of a long-term goal for atmospheric greenhouse-gas concentrations.

The proposal also calls for the establishment of a [definite] date certain for negotiation of emissions obligations for all parties, and calls for the development of graduation mechanisms to strengthen the obligations of developing nations after completion of this phase of the climate negotiations in Kyoto.

### **Institutions and Legal Issues**

The U.S. proposal attempts to minimize the need for any additional institutions. We do believe, however, that it will be necessary to have a new structure for the parties to any agreement. We have titled this the “Meeting of the Parties.” This body shall meet regularly to review the adequacy of the instrument and its implementation.

We also believe that the agreement we are negotiating will only be successful if it is broadly applied in a large number of countries. We have, therefore, included a provision stipulating that the agreement would only enter into force once it has been ratified by a number of parties representing more than a certain percentage of global emissions.

# COMMENTARY



## The Consequences for Life on Earth

*By Jim Fuller*

Scientists speculate that the dinosaurs became extinct after a giant asteroid hit Earth and raised so much dust into the atmosphere that the world was dark for three years. Now many scientists believe human beings may be causing something just as ominous — climatic changes over the coming century larger than any since the dawn of civilization.

The principal change to date is in the balance of gases that form Earth's atmosphere. These naturally occurring "greenhouse gases," including carbon dioxide (CO<sub>2</sub>), methane, nitrous oxide, and water vapor, keep ground temperatures at a global average of 15 degrees Celsius. Without this natural blanket Earth's surface would be about 30 degrees Celsius colder than it is today, making the planet a freezing, barren, lifeless place similar to Mars.

The greenhouse gases keep the surface warm because as incoming solar radiation strikes Earth, the surface gives off infrared radiation, or heat, that the gases temporarily trap and keep near ground level. The effect is comparable to the way a greenhouse traps heat.

The problem is that human activity may be making the greenhouse-gas blanket "thicker." For example, burning coal, oil, and natural gas spews huge amounts of carbon dioxide into the air; the destruction of forests allows carbon stored in the trees to escape into the atmosphere; and other activities such as raising cattle and planting rice emit methane, nitrous oxide, and other greenhouse gases.

Until human populations soared and began burning fossil fuels, greenhouse gases that occur naturally remained in relative balance. But the Industrial Revolution that began in 19th-century Britain ushered in a new age of rapid industrialization that greatly increased man's impact on the natural environment.

Svante Arrhenius, a Swedish chemist, theorized in 1896 that increasing amounts of carbon dioxide released into the atmosphere by coal-fired industries would cause global temperatures to rise. The first credible projections about how much greenhouse warming might occur came in the mid-1960s when scientists at Princeton University estimated that average global temperatures would rise by 2 degrees Celsius in the 21st century if carbon dioxide levels doubled. The development of advanced computers and satellite technology enabled scientists to take ever more detailed measurements of greenhouse gas emissions.

In 1988, James Hansen, a climate specialist at the Goddard Institute for Space Studies in New York, told a Senate committee that global warming is occurring, and that same year the U.N. General Assembly set up the Intergovernmental Panel on Climate Change (IPCC), a worldwide network of 2,500 scientists to advise world leaders. The IPCC declared in a report released last June that "the balance of evidence suggests that there is a discernible human influence on global climate."

Scientists are concerned that if there are increases in these gases, especially carbon dioxide, Earth's atmosphere could warm up to a dangerous degree as more heat is trapped on the Earth's surface. An example of a serious greenhouse effect is Venus where because of the thick CO<sub>2</sub> atmosphere, the planet's cloud-covered surface is hot enough to melt lead.

The World Energy Council, an independent research organization, released a report last year that found that global emissions of carbon dioxide increased by 12 percent between 1990 and 1995.

According to the IPCC, if emissions continue to grow at current rates, it is almost certain that atmospheric



levels of carbon dioxide will double from pre-industrial levels during the 21st century. The most direct result of such an increase, the panel predicts, is likely to be a “global warming” of 1 to 3.5 degrees Celsius over the next 100 years — a rise that is larger and probably faster than any such change over the past 9,000 years.

**T**here is some evidence that this warming has already begun. According to the United Nations Environment Program (UNEP), average world surface temperatures appear to have risen by about 0.5 degrees Celsius over the past 100 years. But although many climatologists believe that this indicates a real change, they caution that the climate varies naturally and this observed warming is still within the range of natural variability. Nevertheless, this warming is broadly in line with what computer models of Earth’s climate predict should have resulted from emissions to date.

But some scientists dispute the level of man’s contribution to the rise, claiming that the main flaw in the science lies in the computer simulations of the Earth’s climate and its response to industrial emissions. Sallie Baliunas, an astrophysicist at Harvard University, says that “only a small part of the 0.5 degree Celsius rise in the past 100 years — no more than a few tenths of a degree — could have been caused by human-made greenhouse gases.” She says that’s because most of the warming occurred before 1940, while most of the 50 percent increase in gas emissions by industrial development and transportation came after 1940.

Early computer models suggested that Earth should be significantly warmer than it is. The models did a poor job of replicating observed climate changes. One of the reasons, some scientists suggest, is because they did not take into account the effect of industrial sulfate emissions, which may be cooling the atmosphere. A recent study published in *Nature* found a stronger correlation between the latest computer models and temperature data collected from weather balloons when the impact of sulfates was incorporated into the models.

Moreover, as the models have become more accurate, they have also predicted smaller changes from human emissions of carbon dioxide and other greenhouse gases.

“As the climate models improve, the predictions get closer to a small, gradual warming indistinguishable from the natural warming we have been experiencing for the last several hundred years,” Baliunas says.

Some surface data point to 1995 as being the warmest year since historical records have been kept, while satellites, which have been measuring the conditions of the atmosphere above the surface for the past 15 years, are hard pressed to demonstrate temperature trends.

The IPCC has listed several likely negative outcomes of global warming, including a rise of 15 to 90 centimeters in average sea levels worldwide by 2100, rendering uninhabitable many heavily populated river delta regions, including entire cities; and a change in weather patterns, bringing more floods or droughts to some areas, with far-reaching effects on agriculture and forestry.

Thomas Karl, a senior scientist at the National Climatic Data Center of the National Oceanic and Atmospheric Administration (NOAA), says global warming is responsible for the large-scale flooding that inundated the Pacific Northwest and California earlier this year.

The U.S. National Weather Service now warns that heavy snow in the upper Midwest and Rocky Mountains and rain-saturated soil elsewhere are likely to lead to the most widespread flooding in a decade. The predicted floods follow recent flooding in the Midwest’s Ohio River Valley that killed at least 20 people.

**S**ince 1900, the number of what scientists categorize as extreme precipitation events — blizzards and heavy rainstorms — has jumped 20 percent in the United States. Climatologists are not sure what causes the trend, although it is consistent with computer models that have looked at the consequences of global warming.

Another threat to human life resulting from climate change, according to some, is the spread of mosquito-borne infectious diseases such as malaria and dengue fever, as the tropical habitat of insects expands northward. Concern mounted in the United States when a dengue outbreak spread to northern Mexico in 1995.

Predictions about global warming led the United States and more than 160 other countries to sign in 1992 the first binding agreement dealing directly with climate change — the U.N. Framework Convention on Climate Change. Under the convention signatory governments agreed, on a voluntary basis, to reduce their greenhouse gas emissions to 1990 levels by the year 2000.

The United States and other nations are now working on a global climate-change treaty that is scheduled to be signed in Kyoto, Japan, in December 1997. The Clinton administration, toughening its environmental policy, is pressing for yet-to-be-determined targets and timetables in the Kyoto treaty negotiations, arguing that voluntary measures have not been able to reduce greenhouse gas emissions.

**T**he commitment to reach legally binding targets and timetables has sparked controversy in the United States. Environmentalists and scientists who support curbs on greenhouse gases say they are crucial to preventing future disaster. But some scientists and industry representatives dispute the accuracy of future warming predictions and oppose limits on energy consumption that they say will cause irreparable harm to the U.S. economy.

Reducing emissions of carbon dioxide and other greenhouse gases not only would mean burning less fossil fuel for industry and transportation but also curbing deforestation, a process that adds to the excess carbon dioxide by destroying trees, which absorb the gas. Carbon dioxide also is released when wood is burned. But according to some, such steps threaten to undermine economic growth and even destroy entire industries if undertaken too quickly.

Most studies suggest that reducing greenhouse gas emissions 20 percent below 1990 levels by the year 2010, as has been proposed by some signatories to the Framework Convention on Climate Change, would reduce the gross domestic product of the United States by one percent to two percent and cost nearly \$100,000 million per year. Other studies suggest that the costs would be even higher, and would require a \$280 per ton carbon tax or its equivalent.

Yet some environmental groups suggest that, based on current computer models, nothing short of a 50 percent reduction in global greenhouse emissions will have much effect on predicted warming, and that it will be necessary to reduce emissions by as much as 80 percent to stabilize greenhouse gas concentrations in the atmosphere.

The Global Climate Coalition, a major industry group, along with other critics downplay the urgency of taking steps to mitigate carbon emissions and call for more research before committing the United States to any binding treaty obligations.

“The United States is 85 percent dependent on fossil fuel, so it is vital for our manufacturing,” says John Shlaes, executive director of the coalition. “Meanwhile China, which is going to equal all the world’s emissions today in the next 25 years, has no meaningful obligation to cut emissions.”

But some U.S. industries view the stricter policy as both environmentally necessary and potentially beneficial economically because it will encourage the development of new technology.

“According to our estimate, with limited government intervention we can increase the number of jobs and decrease by about 12 percent the overall amount of carbon dioxide that goes into the atmosphere,” says Michael Marvin, executive director of the Business Council for Sustainable Energy, whose members include electric utilities, natural gas companies, and appliance manufacturers.

A few scientists have proposed cheaper strategies to reduce carbon dioxide in the atmosphere, such as iron seeding key ocean regions. Scientists believe that microscopic plants in the oceans, called phytoplankton, currently absorb over 30 percent of the carbon dioxide produced by the burning of fossil fuels.

**S**ome have theorized that using iron to “fertilize” ocean regions where phytoplankton is sparse, such as the ocean around Antarctica, would boost its growth and increase the amount of carbon dioxide absorbed from the atmosphere. But most scientists are skeptical about such proposals, and caution that manipulating biological systems that are not fully understood could have negative consequences.

Despite the challenge of global warming, supporters of curbs on greenhouse gases see the 1987 Montreal Protocol — the first global treaty dealing with climate — as reason for optimism. The protocol and its amendments call for phasing out chlorofluorocarbons (CFCs) and other man-made chemicals that deplete Earth’s protective ozone layer.

With such steps as these, some scientists now report that Earth’s ozone layer may well be on the way toward a recovery and that the atmospheric concentration of ozone depleting substances, chlorine in particular, could return to more normal levels just after the turn of the century.

*Jim Fuller writes on science, the environment, and other global issues for the United States Information Agency.*



# The Debate Over Administration Policy

*Congressman John Dingell, a senior member of the House of Representative's Commerce Committee, opposed the administration's global warming policies in a debate February 26 with Timothy Wirth, under secretary of State for global affairs. Following are excerpts of Dingell's remarks.*

I'd like to begin by outlining my concerns about the administration's approach to climate negotiations. In general, I have two major areas of concern. The first is that the approach...is badly conceived. And second that the approach is poorly executed.

The State Department had concluded that the current science proves that global warming is dangerous and requires immediate emissions reductions. But the official United Nations scientific body [the IPCC] has gone only so far as to identify a link between human activity and warming. In other words, we don't know with any degree of precision how big the problem is, and we don't know how fast it is moving, or, indeed, how it can be mitigated.

I took the trouble to get the [IPCC] report, "Climate Change 1995: The Science of Climate Change." This is the document from which my good friend Tim read. He read half [of a] statement. The other half says: "Our ability to quantify the human influence on global climate is currently limited because the expected signal is still emerging from the noise of natural variability. And because there are uncertainties in key factors."

It goes on to say, "Nevertheless, the balance of evidence suggests there is discernible human influence on the global climate." I believe that that is a conclusive statement. But it doesn't say we know what's going on, or how we craft a proper resolution or a proper response to the situation.

Now, the second concern I have is...a shift from voluntary [measures to reduce greenhouse-gas emissions] to

mandatory policies. Initially the Administration's policy was based on voluntary [programs by U.S. industries and] mutually beneficial partnerships between U.S. industries and developing countries.

But sometime in early 1996, however, the tone changed. And mandatory emissions reductions became the goal. Are we setting ourselves up for an economic fiasco?

The outcome [of current international negotiations] may be an agreement late in 1997 imposing mandatory emissions reductions on developed countries and at best only voluntary steps on the developing countries, including China, which...is now right behind us in levels of emissions of CO<sub>2</sub> [carbon dioxide], ahead of the former communist countries of the Soviet Union.

We have already committed ourselves to steps to control emissions that potentially harm our competitiveness. The developing countries are scot free. We've gotten not a single, solid binding commitment from them. For, even if you agree that climate change is a problem, what are we really doing here to protect the environment? If only the developed countries are required to reduce emissions and the developing countries are not required to reduce emissions, what signal does that send to the world? It says, hurry up, get your development going as fast as you can, while you can still get away with it.

Why are we rushing forward to do this before we have the most basic information about climate change policies and how they will affect our economy? We were supposed to have [such an] analysis and assessment by the [administration by the] end of last year. The simple fact of the matter is, before you go about...committing the United States to courses of action that are going to be economically costly, that will change our trading relations and our manner of doing business in the country, I think it's nice to have the facts that you need to have in order to arrive at a proper and a sound judgment.

# REPORTS AND DOCUMENTS



## Dangers of Inaction

Our deliberations have benefited from the careful, comprehensive, and uncompromised work of the Intergovernmental Panel on Climate Change (IPCC), whose efforts serve as the foundation for international concern and whose clear warnings about current trends are the basis for the sense of urgency which my government holds in these matters.

Let me make clear the U.S. view: The science calls upon us to take urgent action; the IPCC report is the best science that we have, and we should use it.

**Timothy Wirth**

*Under Secretary of State for Global Affairs*

*Excerpts of remarks before the Second Conference of the parties to the Framework Convention on Climate Change, Geneva, July 17, 1996*

*The 1995 report of the Intergovernmental Panel on Climate Control says that mankind is affecting the world's climate which could drastically change without international cooperation to limit greenhouse gas emissions.*

*Following are excerpts of the IPCC Second Assessment Synthesis of Scientific-Technical Information. All member states of the World Meteorological Organization and of the United Nations are members of the IPCC.*

*The IPCC report can be found on the Internet at:  
<http://www.unep.ch/ipcc/synt.html>*

The objective of the UNFCCC (United Nations Framework Convention on Climate Change), as expressed in Article 2, is the:

“...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.”

During the past few decades, two important factors regarding the relationship between humans and the Earth's climate have become apparent.

First, human activities, including the burning of fossil fuels, land-use change and agriculture, are increasing the atmospheric concentrations of greenhouse gases (which tend to warm the atmosphere) and, in some regions, aerosols (microscopic airborne particles, which tend to cool the atmosphere). These changes in greenhouse gases and aerosols, taken together, are projected to change regional and global climate and climate-related parameters such as temperature, precipitation, soil moisture, and sea level.

Second, some human communities have become more vulnerable to hazards such as storms, floods and droughts as a result of increasing population density in sensitive areas such as river basins and coastal plains.

The challenges presented to the policymakers by Article 2 are the determination of what concentrations of greenhouse gases might be regarded as “dangerous anthropogenic interference with the climate system” and the charting of a future which allows for economic development which is sustainable.

Given current trends of increasing emissions of most greenhouse gases, atmospheric concentrations of these gases will increase through the next century and beyond. With the growth in atmospheric concentrations of greenhouse gases, interference with the climate system will grow in magnitude and the likelihood of adverse impacts from climate change that could be judged dangerous will become greater.

Effective protection of the climate system requires international cooperation in the context of wide variations in income levels, flexibility, and expectations of the future; this raises issues of efficiency and intra-national, international, and intergenerational equity. Equity is an important element for legitimizing decisions and promoting cooperation.

The longtime-scales involved in the climate system (e.g., the long residence time of greenhouse gases in the atmosphere) and in the time for replacement of infrastructure, and the lag by many decades to centuries between stabilization of concentrations and stabilization of temperature and mean sea level, indicate the importance for timely decision-making.

### **Anthropogenic Interference with the Climate System:**

#### **Interference to the present day**

An increase of greenhouse gas concentrations leads on average to an additional warming of the atmosphere and the Earth's surface. Many greenhouse gases remain in the atmosphere — and affect climate — for a long time.

In contrast to the long-lived greenhouse gases, anthropogenic aerosols are very short-lived in the atmosphere and hence their cooling effect adjusts rapidly to increases or decreases in emissions.

The balance of evidence...suggests a discernible human influence on global climate. There are inadequate data to determine whether consistent global changes in climate variability or weather extremes have occurred over the 20th century. On regional scales there is clear evidence of (some) changes.

#### **Possible consequences of future interference**

In the absence of mitigation policies or significant technological advances that reduce emissions and/or

enhance sinks, concentrations of greenhouse gases and aerosols are expected to grow throughout the next century.

All (IPCC) model simulations (of gas emissions), whether they were forced with increased concentrations of greenhouse gases and aerosols or with increased concentrations of greenhouse gases alone, show the following features:

□ greater surface warming of the land than of the sea in winter;

□ a maximum surface warming in high northern latitudes in winter, little surface warming over the Arctic in summer; and

□ an enhanced global mean hydrological cycle, and increased precipitation and soil moisture in high latitudes in winter.

Warmer temperatures will lead to a more vigorous hydrological cycle; this translates into prospects for more severe droughts and/or floods in some places and less severe droughts and/or floods in other places.

### **Sensitivity and Adaptation of Systems to Climate Change**

Human-induced climate change represents an important additional stress, particularly to the many ecological and socio-economic systems already affected by pollution, increasing resource demands, and non-sustainable management practices.

The vulnerability of human health and socio-economic systems — and, to a lesser extent, ecological systems — depends upon economic circumstances and institutional infrastructure. This implies that systems typically are more vulnerable in developing countries where economic and institutional circumstances are less favorable.

### **Sensitivity of systems:**

#### **Terrestrial and aquatic ecosystems**

Ecosystems contain the Earth's entire reservoir of genetic and species diversity and provide many goods and services....There will likely be reductions in biological diversity and in the goods and services that ecosystems provide society.

Some ecological systems may not reach a new equilibrium for several centuries after the climate achieves a new balance.

□ Forests. Models project that as a consequence of possible changes in temperature and water availability... a substantial fraction (a global average of one-third, varying by region from one-seventh to two-thirds) of the existing forested area of the world will undergo major changes in broad vegetation types — with the greatest changes occurring in high latitudes and the least in the tropics.

□ Deserts and desertification: Deserts are likely to become more extreme, in that, with few exceptions, they are projected to become hotter but not significantly wetter.

□ Mountain ecosystems: The altitudinal distribution of vegetation is projected to shift to higher elevation; some species with climatic ranges limited to mountain tops could become extinct because of disappearance of habitat or reduced migration potential.

□ Aquatic and coastal ecosystems: In lakes and streams, warming would have the greatest biological effects at high latitudes, where biological productivity would increase, and at the low-latitude boundaries of cold and cool-water species ranges, where extinctions would be greatest....Some coastal ecosystems are particularly at risk, including saltwater marshes, mangrove ecosystems, coastal wetlands, sandy beaches, coral reefs, coral atolls, and river deltas. Changes in these ecosystems would have major negative effects on tourism, freshwater supplies, fisheries and biodiversity.

### **Hydrology and water resources management**

Models project that between one-third and one-half of existing mountain glacier mass could disappear over the next hundred years. The reduced extent of glaciers and depth of snow cover also would affect the seasonal distribution of river flow and water supply for hydroelectric generation and agriculture.

Climate change will lead to an intensification of the global hydrological cycle and can have major impacts on regional water resources. Changes in the total amount of precipitation and in its frequency and intensity directly affect the magnitude and timing of runoff and the intensity of floods and droughts; however, at present, specific regional effects are uncertain.

### **Agriculture and forestry**

Crop yields and changes in productivity due to climate change will vary considerably across regions and among localities, thus changing the patterns of production. Productivity is projected to increase in some areas and decrease in others, especially the tropics and subtropics. Existing studies show that on the whole, global agricultural production could be maintained relative to baseline production in the face of climate change projected under doubled equivalent CO<sub>2</sub> equilibrium conditions.

### **Human infrastructure**

Climate change clearly will increase the vulnerability of some coastal populations to flooding and erosional land loss. Estimates put about 46 million people per year currently at risk of flooding due to storm surges. In the absence of adaptation measures, and not taking into account anticipated population growth, 50-cm sea-level rise would increase this number to about 92 million; a 1-meter sea-level rise would raise it to about 118 million....Storm surges and flooding could threaten entire cultures. For these countries, sea-level rise could force internal or international migration of populations.

### **Human health**

Climate change is likely to have wide-ranging and mostly adverse impacts on human health, with significant loss of life. Direct health effects include increases in (predominantly cardio-respiratory) mortality and illness due to an anticipated increase in the intensity and duration of heat waves. Temperature increases in colder regions should result in fewer cold related deaths. Indirect effects of climate change, which are expected to predominate, include increases in the potential transmission of vector borne infectious diseases (e.g., malaria, dengue, yellow fever, and some viral encephalitis) resulting from extensions of the geographical range and season for vector organisms.

### **Technology and policy options for adaptation**

Technological advances generally have increased adaptation options for managed systems....However, many regions of the world currently have limited access to these technologies and appropriate information....The efficacy and cost-effective use of adaptation strategies will depend upon the availability of financial

resources, technology transfer, and cultural, educational, managerial, institutional, legal, and regulatory practices, both domestic and international in scope. Incorporating climate-change concerns into resource use and development decisions and plans for regularly scheduled investments in infrastructure will facilitate adaptation.

### **Analytical Approach to Stabilization of Atmospheric Concentration of Greenhouse Gases:**

Most emission scenarios indicate that, in the absence of mitigation policies, greenhouse gas emissions will continue to rise during the next century and lead to greenhouse gas concentrations that, by the year 2100, are projected to change climate more than that projected for twice the pre-industrial concentrations of carbon dioxide.

#### **Stabilization of greenhouse gases**

All relevant greenhouse gases need to be considered in addressing stabilization of greenhouse gas concentrations. First, carbon dioxide is considered which, because of its importance and complicated behavior, needs more detailed consideration than the other greenhouse gases.

#### **Carbon dioxide**

Carbon dioxide is removed from the atmosphere by a number of processes that operate on different time-scales. It has a relatively long residence time in the climate system — of the order of a century or more. If net global anthropogenic emissions... were maintained at current levels...they would lead to a nearly constant rate of increase in atmospheric concentrations for at least two centuries....Carbon cycle models show that immediate stabilization of the concentration of carbon dioxide at its present level could only be achieved through an immediate reduction in its emissions of 50-70 percent and further reductions thereafter.

#### **Methane**

Atmospheric methane concentrations adjust to changes in anthropogenic emissions over a period of 9 to 15 years.

#### **Nitrous oxide**

Nitrous oxide has a long lifetime (about 120 years). In order for the concentration to be stabilized near current

levels...anthropogenic sources would need to be reduced immediately by more than 50 percent.

#### **Further points on stabilization**

Stabilization of the concentrations of very long-lived gases, such as SF<sub>6</sub> or perfluorocarbons, can only be achieved effectively by stopping emissions.

The stabilization of greenhouse gas concentrations does not imply that there will be no further climate change. After stabilization is achieved, global mean surface temperature would continue to rise for some centuries and sea level for many centuries.

#### **Technology and Policy Options for Mitigation**

Significant reductions in net greenhouse gas emissions are technically possible and can be economically feasible. These reductions can be achieved by utilizing an extensive array of technologies and policy measures that accelerate technology development, diffusion, and transfer in all sectors, including the energy, industry, transportation, residential/commercial, and agricultural/forestry sectors.

The degree to which technical potential and cost-effectiveness are realized is dependent on initiatives to counter lack of information and overcome cultural, institutional, legal, financial and economic barriers which can hinder diffusion of technology or behavioral changes.

By the year 2100, the world's commercial energy system in effect will be replaced at least twice, offering opportunities to change the energy system without premature retirement of capital stock; significant amounts of capital stock in the industrial, commercial, residential, and agricultural/forestry sectors will also be replaced. These cycles of capital replacement provide opportunities to utilize new, better performing technologies.

#### **Energy demand**

The IPCC projects that without policy intervention, there could be significant growth in emissions from the industrial, transportation, and commercial/residential buildings sectors....Because energy use is growing worldwide, even replacing current technology with more-efficient technology could

still lead to an absolute increase in greenhouse gas emissions in the future.

### **Energy supply**

It is technically possible to realize deep emissions reductions in the energy-supply sector within 50 to 100 years using alternative strategies, in step with the normal timing of investments to replace infrastructure and equipment as it wears out or becomes obsolete. Promising approaches, not ordered according to priority, include:

- Greenhouse gas reductions in the use of fossil fuels;
- Switching to non-fossil fuel sources of energy.

### **Industrial process and human settlement emissions**

Large reductions are possible in some cases in process-related greenhouse gases including CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, halocarbons, and SF<sub>6</sub>, released during manufacturing and industrial processes, such as production of iron, steel, aluminum, ammonia, cement, and other materials.

### **Agriculture, rangelands and forestry**

Beyond the use of biomass fuels to displace fossil fuels, the management of forests, agricultural lands, and rangelands can play an important role in reducing current emissions of carbon dioxide, methane, and nitrous oxide, and enhancing carbon sinks.

### **Policy instruments**

The availability of low carbon technologies is a prerequisite for, but not a guarantee of, the ability to reduce

greenhouse gas emissions at reasonable cost.

Mitigation of emissions depends on reducing barriers to the diffusion and transfer of technology, mobilizing financial resources, supporting capacity building in developing countries and countries with economies in transition, and other approaches to assist in the implementation of behavioral changes and technological opportunities in all regions of the globe.

## **Economic Development to Proceed in a Sustainable Manner**

### **The Road Forward**

The scientific, technical, economic, and social science literature does suggest ways to move forward towards the ultimate objective of the Convention. Possible actions include mitigation of climate change through reductions of emissions of greenhouse gases and enhancement of their removal by sinks, adaptation to observed and/or anticipated climate change, and research, development, and demonstration to improve our knowledge of the risks of climate change and possible responses.

Uncertainties remain which are relevant to judgment of what constitutes dangerous anthropogenic interference with the climate system and what needs to be done to prevent such interference. The literature indicates, however, that significant “no regrets” opportunities are available in most countries and that the risk of aggregate net damage due to climate change, consideration of risk aversion and the precautionary approach, provide rationales for actions beyond “no regrets.” The challenge is not to find the best policy today for the next 100 years, but to select a prudent strategy and to adjust it over time in the light of new information.





# Negotiations Background and Calendar

## *A fact sheet released on the climate change convention*

Some 160 countries are now parties to the U.N. Framework Convention on Climate Change (FCCC). The United States was the fourth nation overall, and the first industrialized nation, to ratify the convention.

The convention entered into force on March 21, 1994, and the parties at their first meeting in April 1995 in Berlin started a negotiating process to deal with the threat of climate change in the post-year-2000 period. They called for the agreement on this issue to be adopted at their December 1997 meeting, scheduled for Kyoto, Japan.

This negotiating process is taking place in the convention's Ad Hoc Group on the Berlin Mandate (AGBM). The AGBM has met five times, most recently in March 1997. It will meet again in August and October before the parties assemble in Kyoto in December 1997.

At the AGBM's December 1996 session, the parties were requested to submit proposals by January 15, 1997, to revise the convention. Early AGBM meetings focused largely on analysis and assessment. Since July

1996, these meetings have shifted their emphasis toward negotiations. While the U.S. submission to revise the convention represents a significant step forward in the process, much work remains to be done if a new legal instrument is to be adopted in Kyoto.

The United States has proposed a three-part framework to limit and reduce greenhouse gas emissions among developed countries:

- (1) the target should be binding;
- (2) it should focus on the medium term (the years 2010 to 2020); and
- (3) countries should have flexibility nationally in implementation.

Also, the United States has stressed that it will be critical to include developing countries in next steps because finding a solution to the climate change problem will require a concerted global effort.

In the U.S. view, all four of these concepts are linked, and all four must be included in the new legal instrument.

## CALENDAR OF MAJOR FCCC EVENTS AND MEETINGS

### **1992**

**May** — Adoption of the U.N. Framework Convention on Climate Change — New York

**June** — Convention signed at the Earth Summit - Rio de Janeiro, Brazil

**October** — Convention ratified by the United States

### **1994**

**March** — Convention enters into force

### **1995**

**March-April** — First Conference of the Parties (COP-1) — Berlin

### **1996**

**July** — Second Conference of the Parties (COP-2) — Geneva

**December** — Negotiating session — Geneva

### **1997**

**July 28-August 7** — Negotiating session — Bonn

**October 20-31** — Negotiating Session — [Bonn]

**December 1-12** — Third Conference of the Parties to the U.N. Framework Convention on Climate Change (COP-3) — Kyoto, Japan.

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**Rubin, Barry M.; Hilton, Mark D.**  
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(*Economic Development Quarterly*, Vol. 10, No. 3, August 1996, pp. 262-279)

**Weart, Spencer R.**  
THE DISCOVERY OF THE RISK OF GLOBAL WARMING  
(*Physics Today*, Vol. 50, No. 1, January 1, 1997, pp. 34-40)

**White, Robert M.**  
CLIMATE SCIENCE AND NATIONAL INTERESTS  
(*Issues in Science and Technology*, Vol. 13, No. 1, Fall 1996, pp. 33-38)



# ARTICLE ALERT

## Abstracts of a few recent articles on climate change.

**Broecker, Wallace S.**

THE ONCE AND FUTURE CLIMATE

*(Natural History, vol. 105, no. 9, September 1996, pp. 31-38)*

Scientists are finding that Earth's climate has changed at times far more rapidly than they first thought possible. Sudden shifts of five or more degrees Celsius in a few decades are being found in the geologic record. Broecker advances the theory that the sudden changes occur when two factors coincide — changes in the salt concentration of the North Atlantic and changes in the trade winds blowing across the Pacific Ocean.

**Moore, Curtis A.**

WARMING UP TO HOT NEW EVIDENCE

*International Wildlife, vol. 27, no. 1, January/February 1997, pp. 21-22, 25)*

Moore cites a mountain of new scientific evidence that is convincing even skeptics that global climate change has occurred and that the future of life as we know it is at risk. The majority of scientists now say that global warming can be directly linked to human pollution.

**Murota, Yasuhiro; Ito, Kokichi**

GLOBAL WARMING AND DEVELOPING COUNTRIES

*(Energy Policy, vol. 24, no. 12, December 1996, pp. 1061-1077)*

The authors created a computer model and fed it economics, population, natural resources, and environmental data. The model showed that if developed countries were to help developing countries to industrialize rapidly, their poverty would be mostly ended by the year 2100 and greenhouse gas emissions would be reduced.

TURNING UP THE HEAT

*(Consumer Reports, vol. 61, no. 9, September 1996, pp. 38-44)*

The article presents a concise and informative update on causes and possible effects of global warming; outlines and rebuts the key arguments against global warming; and explains why and how the United Nations-sponsored International Panel on Climate Change (IPCC) recently formally accepted the premise that human behavior is changing the Earth's climate.

**Weart, Spencer R.**

THE DISCOVERY OF THE RISK OF GLOBAL WARMING

*(Physics Today, vol. 50, no. 1, January 1997, pp. 34-40)*

Although a Swedish scientist formulated the greenhouse-gas theory in 1896, the author of this article argues that not much work was done on its implications until accident and new techniques led researchers in the 1950s to accept the idea that the burning of fossil fuels could warm Earth and change climate.

**White, Robert M.**

CLIMATE SCIENCE AND NATIONAL INTERESTS

*(Issues in Science and Technology, vol. 13, no. 1, Fall 1996, pp. 33-38)*

The growing scientific consensus that human activities are responsible for a warming of Earth that could drastically change the climate has prompted the United States to endorse binding reductions in greenhouse gas emissions and brought a new urgency to international negotiations on what to do about the problem, according to Robert M. White. He is a senior fellow at the University Corporation for Atmospheric Research and was the first administrator of the National Oceanic and Atmospheric Administration.

*A more comprehensive Article Alert is offered on the international home page of the U. S. Information Agency:  
<http://www.usia.gov/admin/001/wwwhapub.html>*



# INTERNET SITES

*USIS assumes no responsibility for the content and availability of the resources.*

## **ATMOSPHERE & CLIMATE**

EcoNet, a division of the Institute for Global Communications (IGC), is an Internet network of non-government organizations that deal with a wide range of environmental issues. The section "Atmosphere & Climate" provides links to climate policy; climate research; acid rain, air quality & ozone depletion, among others.

*<http://www.igc.org/igc/issues/ac/index.html>*

## **CLIMATE CHANGE**

This section of USIA's Environment Home Page offers annotated links to U.S. government policy documents, laws and international agreements related to climate change, and other useful sites.

*<http://www.usia.gov/topical/global/environ/envcl.htm>*

## **CLIMATE CHANGE 1995: THE IPCC SECOND ASSESSMENT REPORT**

The 2,000 page-report, released in March 1995, offers the best evidence yet collected on climate change. This site offers a synthesis report, three summaries for policymakers, and order forms for the complete text.

*<http://www.unep.ch/ipcc/ipcc95.html>*

## **CLIMATE CRISIS**

This section of the Greenpeace web site offers the "ABCs" of climate change, scientific material, and international agreements texts.

*<http://www.greenpeace.org/~climate/>*

## **CLIMATE DIAGNOSTICS CENTER**

Maintained by the U.S. National Oceans and Atmosphere Administration (NOAA), the Climate Diagnostics Center has a mission "to identify the nature and causes for climate variations on time scales ranging from a month to centuries. The goal of this work is to develop the ability to predict important climate variations on these time scales."

*<http://www.cdc.noaa.gov/>*

## **CO 2 BRIEFING**

The site is managed by the International Council for Local Environmental Initiatives (ICLEI), an international association of municipalities, and outlines problems and solutions for cities faced with the possibilities of climate change.

*<http://www.iclei.org/sbtoc.htm>*

## **GLOBAL CHANGE MAGAZINE**

Published by the Pacific Institute for Studies in Development, Environment and Security (Oakland, California), this electronic magazine "seeks to familiarize the public with the issues associated with climate change and ozone depletion." In addition to brief articles written for general audiences, "Global Change" provides direct links to information sources elsewhere on the Internet.

*<http://www.globalchange.org/>*

## **INDEX TO CLIMATE CHANGE FACT SHEETS**

This site links to more than 90 fact sheets on aspects of climate change ranging from "the role of greenhouse gases" to "Methane emissions from the disposal of livestock waste and is "compiled by the Information Unit on Climate Change, an office of the United Nations Environment Programme (UNEP).

*<http://www.unep.ch/iucc/fs-index.html>*

**INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)**

The IPCC was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess the most up-to-date scientific, technical, and socio-economic research in the field of climate change.

*<http://www.unep.ch/ipcc/ipcc-0.html>*

**NASA MISSION TO PLANET EARTH**

The U.S. National Aeronautics and Space Administration (NASA) Mission to Planet Earth is studying how our global environment is changing. Using the unique perspective available from space, NASA is observing, monitoring and assessing large-scale environmental processes, with an emphasis on climate change. These data, which NASA is distributing to researchers worldwide, are essential to humans making informed decisions about protecting their environment.

*<http://www.hq.nasa.gov/office/mtpe/>*

**POLICY ASPECTS OF CLIMATE CHANGE**

Compiled by scientists at the U.S. National Center for Atmospheric Studies, this collection of essays considers various appropriate responses at local, regional, national, and international levels to climate change.

*[http://www.dir.ucar.edu/esig/cli\\_policy.html](http://www.dir.ucar.edu/esig/cli_policy.html)*

**UNDERSTANDING CLIMATE CHANGE**

Scientific and policy aspects of climate change are addressed in this site, maintained by the Union of Concerned Scientists.

*<http://www.ucsusa.org/global/climate.html>*

**THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE**

This site contains public information materials produced by the United Nations Environment Programme's (UNEP) Information Unit for Conventions and the Intergovernmental Panel on Climate Change (IPCC).

*<http://www.unep.ch/iucc.html>*

**U.S. DEPARTMENT OF STATE FACT SHEET ON GLOBAL CLIMATE CHANGE**

The document, released in March 1995, outlines the U.S. government's official policy on climate change.

*<http://www.usia.gov/topical/global/envIRON/climfac.htm>*

**U.S. DEPARTMENT OF STATE FACT SHEET ON THE U.S. CLIMATE CHANGE PROPOSAL**

This fact sheet, released in January 1997, presents the U.S. government's official policy on confronting climate change.

*[http://www.usia.gov/topical/global/envIRON/fact1\\_97.htm](http://www.usia.gov/topical/global/envIRON/fact1_97.htm)*

**THE U.S. GLOBAL CHANGE RESEARCH PROGRAM**

Comprising 18 departments and agencies of the U.S. government, the USGCRP has been working since 1989 to better understand natural and human-induced changes in the Earth's environment. Its Internet site offers technical data and analysis on numerous issues related to climate change.

*<http://www.usgcrp.gov/>*