F.A.S. PUBLIC INTEREST REPORT

Journal of the Federation of American Scientists (FAS)

Volume 49, No. 2 March/April 1996

FAS HOSTS CLIMATE CHANGE CONFERENCE FOR WORLD BANK

The World Bank considers the environmental implications of proposed loans with one interesting exception: it does not take into account the global environmental impact of the CO_2 generated by its projects.

Accordingly, on December 8-10, the Federation hosted a two-day retreat, co-sponsored by the World Bank, on the question:

"Should World Bank decision-making on lending for projects that would result in the emission of greenhouse gases reflect the global damage which such emissions might cause?"

At present, this is not done because of an underlying debate over who should pay for the resource costs of incorporating such considerations.

Were the Bank to shift its assessments accordingly, without any off-setting charges to developed countries, certain loans (e.g. for coal-fired electricity generating plants) would be replaced by others (e.g. for electricity generating dams or nuclear plants) and the resource reallocation costs--of shifting from one more efficient project to another less efficient one--would effectively be paid by the developing country.

Who Pays for the Costs?

Developing countries, who are the recipients of these loans, would argue that--unless the developed countries paid for the difference--this would violate the consensus underlying the Framework Convention on Climate Change which calls on developed countries to pay for the costs of limiting CO_2.

Consistent with its scientific code, the Federation organized a conference that had a broad range of scientific opinion on the dangers of climate change and, insofar as one could in a two-day conference, discussed this issue from soup to nuts.

Would a Shadow Price Affect Bank Loans?

Despite the broad range of scientific and economic opinion present, there was a consensus that the Bank should, at least, study what effect such charges would have without prejudice to what would be done thereafter. A summary report, prepared by two conference assessors chosen by the Bank, Jose Goldemberg and Robert Watson, included this consensus in their report when they said:

"The World Bank should study what effect a shadow price varying between 5 and 120 dollar/ton of carbon would have had on the portfolio of loans approved during the last three years. This range of shadow prices corresponds to the damage costs estimated by the Intergovernmental Panel on Climate Change (IPCC) for a two-times carbon dioxide world."

Goldemberg and Watson went on to advance the view, which many but perhaps not all participants held, that: "If utilization of a shadow price would have significantly influenced the portfolio in

This newsletter contains a summary of the conference written by the Bank-chosen assessors Jose Goldemberg and Robert Watson, and does not, of course, represent the full complexity of the conference or the views of all participants--excerpts from which are used to illuminate the newsletter.

For those who are interested in learning more, we have edited excerpts of the transcript which will be available in an extended newsletter from FAS for $10.

directions that would have promoted 'climate friendly sources of energy' (such as renewable energies), the World Bank should try to find ways of covering the additional costs of such projects (e.g. an expanded Global Environmental Facility or through joint implementation projects using private sector funds.) This would promote the use of climate friendly technologies yet protect developing countries from increased loan costs."

FAS is grateful to all of the participants for their help in this workshop retreat. Special thanks go the World Bank, and its Vice President for Environmentally Sustainable Development, Dr. Ismail Serageldin, for agreeing to review this contentious issue. —Jeremy J. Stone

Question: In the public reports of the projected climate changes the most frightening thing, I think, is the statement that there will be increased extremes, there will be increased violence of storms, there'll be increased variabilities. What is the foundation for this statement from increased greenhouse gases?

DR. KARL: I think the statement, as you described it, is a mischaracterization by the press.

A mischaracterization of what the scientific community has assessed. I've seen some of these articles in the popular press, and in fact, I've had some of my work quoted and misquoted in the popular press along the lines you mention.

If you look at the most recent IPCC report, which I believe accurately reflects the state of the affairs with respect to what you can expect with extremes, there is a chapter in there that talks about projections as to what is predicted by models.

Nothing in the IPCC report suggests that we can be confident about any expected change in hurricane intensity or frequency. There is observational evidence to suggest that there's been an increase in extratropical cyclones, however, especially over the North Atlantic.

—Thomas Karl, National Climatic Data Center

The *FAS Public Interest Report* (USPS 188-100) is published bimonthly at 307 Mass. Ave., NE, Washington, D.C. 20002. Annual subscription $25/year.
POSTMASTER: Send address changes to FAS, Public Interest Rep., 307 Massachusetts Avenue, NE, Washington, D.C. 20002.

Climate Change & the FAS Conference as Seen by the Assessors

Part I: The Human Influence on the Earth's Climate, and the Consequences of Climate Change for Ecological Systems, Socio-economic Sectors and Human Health

At this interdisciplinary conference, the number of experts on the climate itself was necessarily very limited. While most of the attendees held views similar to those expressed in the recent Intergovernmental Panel on Climate Change (IPCC) assessments, a number of attendees, including R. Lindzen and P. Michaels, held quite different views. Lindzen, Michaels and some others believe that the importance and urgency of the climate change issue has been exaggerated, even by IPCC, and that climate change does not pose a serious threat to society.

Key findings:

The World Bank should primarily base any policies regarding climate change on the scientific and technical reports of the Intergovernmental Panel on Climate Change and other credible national and international assessments, not on the views of the group of scientists who attended the FAS meeting, which was inevitably too small to be representative. The IPCC represents the large majority views of the international scientific community and attempts to represent and discuss minority views. In writing this summary, we recognize that some attendees at the FAS meeting do not share the views of the IPCC.

DR. WAGGONER: While climate change may conceivably change yields, wealth and incentives to adapt will raise yields for sure. So too, will investment in water sources, chemical supplies and training and research for productive farming. The Clydesdales are wealth, incentives, water, fertilizer, pest control, training and research.

Drawn by these sturdy reliable Clydesdales, farming will promptly, the record shows, adapt to changed climates.

—Paul Waggoner, Connecticut Agricultural Research Station

DR. KATES: For a long time there was a big split within our community between the preservationists and the adaptationists. The preservationists never wanted to discuss adaptation because they want to push very quick action in the world to keep down greenhouse gas additions and to prevent global warming.

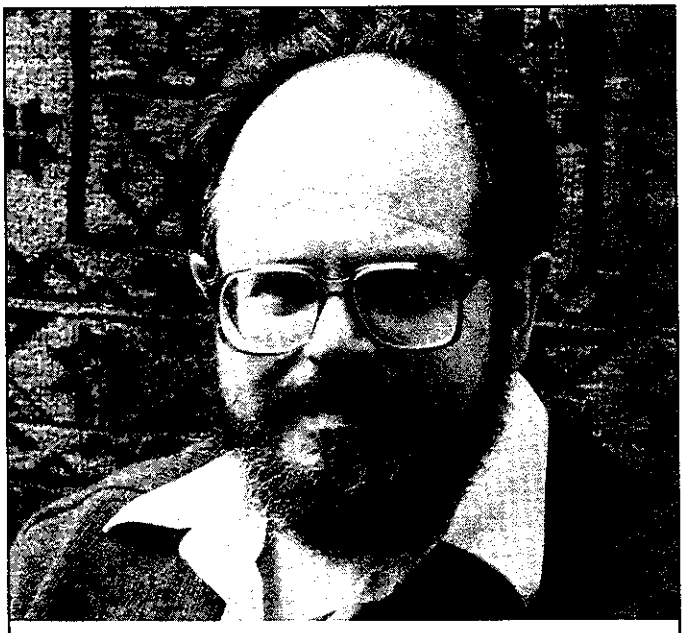
The adaptationists have a kind of a view that adaptation is cost-free and just happens naturally. But while farmers who successfully adapt may seem to do it painlessly, they leave behind many farmers who don't successfully adapt.

I think what's emerged is this. No one has seriously challenged the idea that climate change, whether it's large or small, will place an inequitable burden on the poorest parts of the world.

—Robert Kates, Brown University

Key conclusions consistent with IPCC regarding climate change:

- the atmospheric concentrations of greenhouse gases (e.g., carbon dioxide, methane, and nitrous oxide) and aerosols have increased since the beginning of the pre-industrial era because of human activities, primarily due to energy and agricultural practices;
- greenhouse gases tend to warm the atmosphere and, in some regions, aerosols tend to cool the atmosphere;
- changes in the radiative heating of the atmosphere due to changes in greenhouse gases can be calculated quite accurately. In contrast, the radiative effects of aerosols are quite poorly quantified.
- while the Earth's climate has been relatively stable for the past 10,000 years it is now changing. The Earth's surface temperature has increased by about half a degree centigrade over the last century, and the last few decades have been the hottest this century;
- regional changes in climate have been observed consistent with those predicted by climate models, e.g., there have been changes in the frequency and



DR. LINDZEN: Of the two ways by which the public is convinced of the sound foundations of the warming hypothesis, one is the simplistic picture that the IPCC always presents, in which the sun heats the earth and the earth must emit radiation to cool. If you have greenhouse gases that inhibit this then, of course, you warm further. The simplistic picture encourages people to feel they understand the process. It is, of course, as usual, incorrect, or at least seriously incomplete, and by itself, suggests little warming. The second way is more mystical. Climatologists use large (and small) computer models to predict significant warming.

The question for many of us is why should you believe the models? If you didn't change the temperature profile, if you didn't have water vapor change and if you kept everything constant, the usual thing in the simplistic picture, or some variant of it, doubling CO_2 would give you a temperature change somewhere on the order of one-half degree.

The fact that models produce more than that is a result of what is called feedbacks. I'm using the word feedbacks for things that actually contribute to the sensitivity of the atmospheric response. And here you have lapse rate, water vapor, clouds, snow albedo. Don't worry so much about the details of these. But you have to understand that unless these each amplified what was just due to CO_2, you wouldn't get these two to four degree estimates.

—Richard Lindzen, MIT

distribution precipitation patterns in the U.S. (an increase in winter time precipitation and an increase in intense precipitation events);

▸theoretical models that take into account the observed increases in the atmospheric concentrations of greenhouse gases and sulfate aerosols simulate the observed changes in both surface temperature and its vertical distribution as well. Hence, the IPCC reports that there is a discernable human influence on the Earth's climate;

▸future emissions of greenhouse gases and the sulfate aerosol precursor, sulfur dioxide, are sensitive to a number of factors including changes in population and gross domestic product, the rate of diffusion of new technologies into the market place, production and consumption patterns, land-use practices, energy intensity, and the price and availability of energy;

▸most projections suggest that greenhouse gas concentrations will increase, possibly significantly, during the next century in the absence of policies specifically designed to address the issue of climate change, e.g., carbon dioxide emissions are projected to range from 6 to 36 GtC per year in the year 2100: compared to current emissions of 6 GtC per year;

▸IPCC reported a range of climate sensitivities (1.5 - 4.5 degree C for 2 times CO_2, with a best estimate of 2.5 degree C). This range is consistent with the estimates of most climate scientists; the major exception being R. Lindzen who favors a value closer to 0.3. If Lindzen were correct, then human - induced climate change would not be a severe problem;

▸based on plausible ranges of greenhouse gas and sulfur dioxide emissions (IPCC IS 92), climate models project that the global mean surface temperature could increase by 0.8 to 3.5 degrees C by 2100, and more thereafter even if greenhouse gas concentrations are stabilized (a rate significantly faster than any observed change during the last 10,000 years);

▸temperature changes are expected to differ by region, however our confidence in regional predictions remains low;

▸while global precipitation will inevitably increase because of increased evaporation and evapotranspiration, projecting regional changes is difficult;

▸sea level is predicted to increase by 30-90 cm by 2100, and much more thereafter, caused primarily by thermal expansion of the oceans and the melting of

glaciers;

▸the incidence of extreme temperature events, floods, and droughts is expected to increase in some regions, but it is unclear whether there will be changes in the frequency and intensity of tropical storms, cyclones, and tornadoes;

▸the time frames associated with climate change range from years to millennia because of the lifetime of carbon dioxide (the main anthropogenic greenhouse gases is decades to many centuries), the response time of the climate system, and the useful lifetime of some capital stock (e.g., power plants are decades).

The key conclusions, consistent with IPCC, regarding the impacts of climate change include:

▸regional and global changes in temperature, precipitation, soil moisture, and sea level are expected to have wide-ranging and potentially adverse effects on physical and ecological systems, human health, and socio-economic sectors, thus affecting the economy and the quality of life for this and future generations;

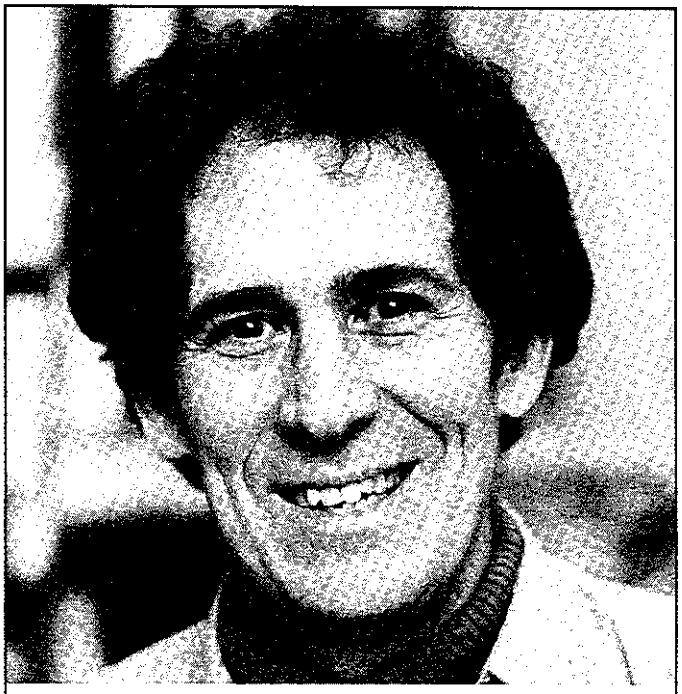
▸human-induced climate change represents an important additional stress in a world where many ecological and socio-economic systems are already threatened by pollution, increasing resource demands and non-sustainable management practices;

▸most systems (human health, ecological, and socio-economic systems) are sensitive to both the magnitude and rate of climate change;

▸impacts are hard to quantify because of uncertainties in regional climate projections, systems are subject to multiple stresses, and a lack of understanding of some key processes;

DR. SCHLESINGER: I want to pursue this just a little further about the climate sensitivity. If it's the low end that Dick Lindzen indicates, then the world has a very minor problem, in terms of the other problems that are extant, we could probably almost ignore this issue. If the climate sensitivity is up on the high end of IPCC, then it's quite another matter.

—Michael Schlesinger, University of Illinois



DR. SCHNEIDER: There is no responsible person, in my opinion, who will assert that they know precisely what will happen. There's also no one who will assert that we can know, to a very high degree of statistical confidence, what the climate sensitivity is, and therefore, estimates will have a high degree of subjectivity for a considerable time, although the degree of subjectivity may narrow.

Paleoclimatic measurements are reconstructed from things such as the widths of tree rings. And widths of tree rings are proportional to temperature and drought, but they're not perfect measures of temperature. They're what we call nonlinear indicators. Although they're widely distributed around the world, these proxies do not make perfect global averages either.

All of that is well understood, which is why the "preponderance of evidence" is the better metaphor than "guilty" and why we look at so many multiple lines of evidence, because no individual one line yet is convincing. But the question is whether they, taken together along with a basic theoretical understanding, form a coherent picture. And, as I've asserted, that picture is coherent--but by no means is it complete beyond a reasonable doubt.

I think some of the issues Dick raises--and I might say, he's not the only "contrarian" here--are open questions.

—Stephen Schneider, Stanford University

DR. SERAGELDIN: Bank policy is based on the notion that we are not a grant giving agency. And it's our contention that we have two obligations to our member states or borrowers. One is that we try to insure that the money goes for the least cost solution and two, that it is unreasonable to ask borrowers to borrow money that they would have to repay for an unproved technology.

So to ask the poor countries of the world to borrow money in order to expand the market, so that technologies that are being developed in the north would have a better chance of being further developed, is not, in our judgment, a fair and equitable way of dealing with the poor countries of the world.

We have little impact on the domestic policies of the industrialized countries because we are not allowed, by our statutes, to interact directly with the administrative bodies of these countries.

The President of the United States was unable to get a five cent per gallon tax in the United States. If he can't do that, how can you possibly expect that somebody from the World Bank is going to be able to change attitudes in the United States. And let's face it, this is where the major lead, in terms of energy and emissions in the OECD countries, has to come.

How our funds are used is a norm-setting exercise. Although we fund a relatively small proportion of the projects in developing countries, we tend, through discussions with these countries, to set standards that tend to be followed by other financiers and therefore, to set a higher standard.

—Ismail Serageldin,
Vice President, The World Bank

▸developing countries are more vulnerable than developed countries to climate change because of their socio-economic conditions;

▸adaptation depends upon technological advances, institutional arrangements, availability of financing, information exchange, technology transfer and financing;

▸climate change concerns must be incorporated into resource-use and development decisions;

▸an enhanced resilience to natural climate variability will improve societies ability to adapt to anthropogenic climate change;

The Key sectoral impacts due to climate change include:

▸Human Health: Human health can be adversely affected directly and indirectly: direct health effects include increases in heat-related mortality and illness resulting from an anticipated increase in heat waves, while indirect effects are expected to include increases in the transmission of vector-borne infectious diseases, including malaria, dengue, yellow fever and encephalitis, and non-vector-borne infectious diseases such as salmonellosis and cholera.

▸Food Security: The general conclusion is that there may be significant adverse consequences for food security in some regions of the world, especially in the tropics and subtropics, where many of the world's poorest people live, even though the effect of climate change on global food production may be small to moderate.

▸Natural Ecosystems: The composition, geo-

MS. PONCE-NAVA: I have found, in general, a very patronizing approach from most of the presenters in the sense of trying to figure out what should be done to make developing countries behave in one way or another in relation to certain problems that climate change presents.

I hope that we can switch that approach, in a way, and talk more about what the World Bank can do in supporting the development of developing countries, which is the mandate it has as an institution.

—Diana Ponce-Nava, Legal Adviser to the Minister of the Environment, Mexico

graphic distribution and productivity of many ecosystems will shift as individual species respond to changes in climate, and there will likely be reductions in biological diversity and in the goods and services ecosystems provide society. For example, climate change is expected to occur at a rapid rate relative to the speed at which forests grow, reproduce and re-establish themselves. Therefore, species composition of impacted forests is likely to change, entire forest types may disappear, while new assemblages of species and hence new forest ecosystems may be established.

▸Human Habitat Loss: Small islands and deltaic areas are particularly vulnerable to sea level rise. A one-meter sea level rise is projected to result in land loses ranging from 0.05% in Uruguay, 1.0% for Egypt, 6% for the Netherlands, 17.5% for Bangladesh to about 80% of the Marshall Islands, thus affecting large numbers of people, e.g. tens of millions of people in China and Bangladesh.

Implications of Climate Change for Governments and the World Bank

Based on evidence discussed in Part I, there are a number of reasons for governments and institutions such as the World Bank to take climate change seriously:

▸the atmospheric concentrations of greenhouse gases and aerosols are increasing because of human activities;

▸there is clear evidence of a discernable human influence on the climate;

▸without global climate specific policies to mitigate greenhouse gas emissions, the Earth's temperature is projected to increase by between 0.8 to 3.5 degrees centigrade by 2100: a rate faster than anything observed during the last 10,000 years;

▸these projected changes in climate will result in adverse affects on human health (particularly via vector-borne disease) and many ecological systems (especially forests) and socio-economic sectors (e.g., the regional production of food), with developing countries being particularly vulnerable;

▸the current non-binding measures for Annex 1 countries alone are inadequate to achieve the goals of Article 2;

The World Bank should continue to incorporate climate change concerns into resource-use and development decisions, and continue to enhance resilience of society to natural climate variability, thus improving society's ability to adapt to anthropogenic climate change.

The evidence suggests that governments and

DR. STEER: What about climate change? The current operational guidelines for the World Bank are fairly general here. When it comes to global environmental concerns the requirements are that you assess the impacts on global externalities, you raise them with the governments you're dealing with, but you don't insist that those externalities are forced into the decision-making process. And the reasons for that are obvious.

They relate to the fact that, after all, it's their money. We're a bank. We're not a charity. We lend money to these countries. And for most of them they borrow at market based interest rates. It being their money, they should choose what it goes for. There's also an equity issue that's very clear. Why should Brazil pay more for its energy when America is choosing not to? There's another point, and that is the convention--the framework convention on climate change-- makes it very clear that developing countries have every right to exploit their non-renewable energy sources.

...

One option would be to say to a country after doing this shadow pricing, we'll only finance the least cost having incorporated that global environmental externality into account, and you're going to have to pay for it.

This we are not ready to do at the moment. I can say with some certainty, our shareholders from the developing countries would not appreciate that. And I think there are very serious problems with equity.

But what we could do is to estimate the calculations, and come up with a prioritized list of investments and say to the international community we're only willing to finance the top one but we're going to seek international financing for the incremental costs, over what the first best would have been.

—Andrew Steer, The World Bank

DR. LAVE: Unless we manage to get the whole world developed, it will make little difference what we say or what the World Bank does. We need to raise incomes to the level where the natural fertility rate goes below reproduction levels.

We trash equity concerns and foment violence by ordering China, for example, to stop growing or its equivalent by imposing large carbon taxes.

...

We have set up a terrible choice for the developing countries. If we have climate change, they are the ones who are affected most in ways that we may not be able to help. If we slow climate change by slowing down their growth, then they might be protected, but they will be poorer. I don't think this is an issue among the developed nations. They can afford to have CO_2 abatement. But we wind up implicitly making a choice among the developing nations. This bothers me in terms of the choice itself, and it bothers me in terms of our ability to be able to enforce that choice on somebody else.

—Lester Lave, Carnegie Mellon University

institutions cannot wait until cause and effect has been established unambiguously because the time scales associated with the climate system are years to millennia. Therefore, because it will not be easy to reverse the adverse consequences of climate change, governments and institutions should take a precautionary approach to climate change.

Part II: Economic and Institutional Aspects of Climate Change

Experience has shown that national governments and international organizations can move relatively quickly, individually and collectively, to face unanticipated threats and challenges once they have been clearly characterized. Two prominent examples, which in each case provide an important lesson for dealing with the issue of global warming:

a) the worldwide adoption of limitations to the use of substances that destroy the ozone layer (mostly chlorofluorocarbons and halons). However, while the Montreal Protocol has been deemed by many to be a success, it should be remembered that the ozone layer will not recover until the middle of the next century because governments and industry demanded near-certain knowledge regarding the effects of human activities on the ozone layer prior to concerted action. This suggests that concerted government action must be taken to limit the anthropogenic emissions of greenhouse gases before all scientific uncertainties are resolved because of the long time constants associated with the climate system.

b) the US cap on the amount of sulfur oxides and other pollutants that can be emitted into the atmosphere. This has led to an active system of tradable permits. This suggests that emissions trading can lead to environmental protection in the most cost-effective manner: hence the issue of activities implemented jointly (among all parties, not just Annex I parties) needs to be given measured consideration by all governments.

In spite of the scientific evidence linking human activities (emissions of greenhouse gases, particularly carbon dioxide) to climate change and the potential for adverse consequences, national governments and international organizations are moving cautiously in adopting measures to face the problem of human-

DR. CLINE: There is this whole question -- and Lester talked a lot about that -- as to whether somehow costs should be forced on the developing countries. We should keep in mind, whether we believe it or not, that the Rio conference had language about the industrial countries bearing the incremental costs.

On the World Bank's shadow pricing it does seem to me that there would be a lot to be said for getting started at the kind of range that Lester was talking about.

And there is a unique feature about the World Bank with regard to this problem, because its members are universal. Whereas if a finance minister in an individual country tries to decide something about a carbon tax, he inherently runs into the externality problem.

—William Cline, Institute for International Economics

DR. MICHAELS: We have to be very careful about claiming that a group of scientists can demonstrate, with any reliability, the spatial and physical characteristics of agrosystems and ecosystems 100 years in the future. The mistakes that would have been made in projections going back 100, 200, 300 years, would have been much larger than any change that was projected to occur.

Number two, ecosystem models are, by and large, driven by moisture balance. The errors in the representations of daily rainfall are so large in the models as to make those projections meaningless.

I think what we have to recognize here is we know very, very little. And if we're in the business of taking people's tax monies in order to create policy, based upon that knowledge, we're in the business of taking it for not very good reasons.

—Patrick Michaels, University of Virginia

induced climate change. Two approaches will have to be used to tackle human-induced climate change: (i) mitigation, ie., the avoidance of greenhouse gas emissions (this would be analogous to the approach used to protect the ozone layer where the emissions of CFCs and halons were eliminated) or the enhancement of sinks (e.g., carbon sequestration in vegetation and soils), and (ii) adaptation, i.e., adjustments in practices, processes or structures of systems to changes in climate.

The mitigation approach would mean governments accepting targets and timetables, or common measures, to limit net emissions. These can be binding or voluntary. To be effective, this would mean the adoption of the most energy efficient technologies as well as reducing the use of fossil fuels. Even if the principle of targets and timetables was accepted, two immediate challenges would have to be faced: (i) quantifying an acceptable level of emissions (today's level of 358 ppmv? double preindustrial at 560 ppmv? triple pre-industrial at 840 ppmv? or higher?) and (ii) distributing the burden of emissions limitations between countries, which is a major equity issue. While no governments have accepted mandatory emissions limits, industrialized countries have committed themselves to voluntarily limit their emissions in the year 2000 to the same as in 1990. Developing countries have not yet accepted any emissions limitations. When prioritizing near-term actions, it should be remembered that many mitigation actions can be cost effective and have additional benefits, e.g., an improvement in air quality.

Carbon taxes have often been discussed as one approach to increase the cost of fossil fuel as a way to capture the possible damages resulting from their use. While carbon taxes have been adopted by some countries, they are far from gaining general acceptance (especially in countries such as the USA). If set at a high enough level these taxes could discourage the use of fossil fuels and open the way for an extensive use of renewable energy sources which are not yet, in most cases, economically competitive.

Climate concerns should be incorporated into resource-use and development decisions, which would continue to enhance the resilience of society to natural climate variability and improve society's ability to adapt to anthropogenic climate change. We should remember that developing countries are more vulnerable than developed countries to climate change because of their socio-economic conditions. Climate change will overburden their production systems and lower their quality of life and their ability to adapt

DR. SCHEER: Our experience is that the question of renewable energy introduction is not only the price. Much more important are the structures and the social behaviors. We can show, in general, that a state of development need not mean, in general or in principle, a limited growth. It must mean sustainable growth.

...

One problem for the implementation of alternatives is the structure of the World Bank itself, because the alternative investments are decentralized investments. Instead of one 1,000 megawatt plant, for instance, several thousand or several hundred thousand windmills or photovoltaic facilities might be involved.

Therefore, the structure which is appropriate to single big projects is not appropriate for decentralized investments with a lot of supporters.

—Hermann Scheer, EUROSOLAR

DR. RAMAKRISHNA: The situation today is that we have a Climate Convention that is in force with more than 150 countries that have ratified it, and more than 100 of them are clients of the World Bank.

The convention is explicit in terms of what it seeks to accomplish as an objective, but it only gives a framework of reference to use in realizing that. It doesn't set clearly defined targets and timetables but alludes to a kind of "criteria" to be used.

The convention has established a financial mechanism, and the financial mechanism now is the Global Environment Facility. And the World Bank is a partner in that facility. At the first Conference of the parties, the World Bank clearly outlined its own policy in dealing with climate change and outlined a series of steps that it seeks to take to help its client countries cope with climate change.

Having said that, our session is to discuss whether the World Bank's loans should be influenced by climate change. Well, yes, for reasons that I've just outlined, both from the Bank's point of view and from the point of view of the countries that have ratified the convention, they do see a role for the Bank.

If, as we talked about this morning, the shadow price were to be advanced by the Bank, would the country that is receiving the loan see that as a condition? Conditionality is a "bad" term in international discussions, particularly when it comes to the Bank's conditionality.

But in reality Bank terms often include specific requirements, whether called conditionality or not, that are oftentimes negotiated and oftentimes prescribed by the Bank.

So the question is how do you go about operationalizing the relationship between the Bank and the country?

If we take the shadow price to be $10 or $20 per ton of carbon, the one big question, of course, is who is going to pay the additional money.

What sorts of policies can be put in place that prevent that additional cost from becoming a burden on the developing countries?

—Kilaparti Ramakrishna, Woods Hole Research Center

Ramakrishna

will depend upon technological advances, institutional arrangements, availability of financing, information exchange, technology transfer, and financing.

A minimal sensible approach seems, therefore, to be adoption of "no regrets" or "win-win" measures that would reduce emissions but that are at the same time justifiable on other grounds (including economic grounds) such as energy conservation, system optimization, etc. IPCC suggests that measures that go beyond no regrets are "economically" justified because of damages caused by climate change to human health, ecological systems, and socio-economic sectors.

In order to promote "win-win" measures the international community established the Global Environment Facility (GEF) to assist developing countries overcome initial financial hurdles. The GEF provides grant resources to national projects that have global environmental benefits. Present funding level is quite modest (US $2 billion over 4 years) but a number of initiatives are being pursued with these precious, but limited resources. The GEF has to catalyze World Bank lending, which had to stimulate the private sector.

Most economists and energy experts agree that it is sensible to go beyond "no regrets" and establish a small carbon tax that would not be high enough to discourage fossil fuel use, but which will signal the direction to go. A tax of 10 dollars per ton of carbon has been suggested (roughly 1 dollar per barrel of oil or less than 10% of present cost of oil). Even such a small tax would permit amassing roughly 10 billion dollars per year to be used in promoting alternatives that would prevent/mitigate climate change such as energy conservation, the use of renewable energies, etc. One example of such taxation is Non Fossil Fuel Obligation (NFFO) created in England in 1991. In this scheme electricity consumers pay a surcharge of 11%, corresponding to 2 billion dollars annually, which is used to subsidize nuclear electricity generation and renewable energies. This corresponds to US$20/ton of C.

Implications for Governments and the World Bank of Part II

The World Bank should expand its portfolio of projects in energy efficiency and renewable energies because of the critical role they will play in sustainable development.

The World Bank should not unilaterally introduce a carbon tax on their loans to developing countries because this would overburden them, and it would not be equitable when developed countries such as the US have not adopted such a tax. In addition, it would be more desirable to introduce a carbon tax in all countries, particularly the industrialized countries which are currently responsible for over 60% of global carbon emissions from fossil fuels.

The World Bank should study what effect a shadow price varying between 5 and 120 dollars/ton of carbon would have had on the portfolio of loans approved during the last three years. This range of shadow prices corresponds to the damage costs estimated by IPCC for a two-times carbon dioxide world. If utilization of a shadow price would have significantly influenced the portfolio in directions that would have promoted "climate friendly sources of energy" (such as renewable energies), the World Bank should try to find ways of covering the additional costs of such projects (e.g., an expanded GEF or through joint implementation projects using private sector funds). This would promote the use of climate friendly technologies yet protect developing countries from increased loan costs.

Consideration of "shadow costs" of greenhouse gases that have global consequences would add another dimension to the World Bank process of analyzing loans which already internalize externalities of domestic significance, such as local pollutants.

—Jose Goldemberg, Sao Paolo University, Brazil
—Robert Watson, White House Office on Science and Technology Policy

DR. ECKAUS: I see no evidence that the world is running out of ideas for improving quality and quantity of things people want.

If future generations are going to be a lot better off than we are, why worry about them?

—Richard Eckaus, MIT

DR. NEWCOMBE: How can we conceivably have much of an impact with the scale of funding that we have? I mean, $2 billion, even if spent entirely on climate change in the next three years, it's going to give us eight or nine days of climate change mitigation at the current level of emissions. So what is our responsibility?

It's twofold. First, in our regular dialogue with our clients we can recognize many, many win, win options, many, many aspects of policy, which, if acted on purely from the point of view of self interest at the national level, will provide high domestic returns, like improving energy prices, like repricing a lot of commodities, timber and the clearing of land and all sorts of things which have climate change implications. This would have tremendous benefits for the global environment in this regard.

The price distortions in developing countries, and the economies in transition, cost about $210 billion in the energy sector each year. If they were adjusted, we would reduce global carbon emissions by 7 percent.

But we should recognize that the agents of change, the source of the technology, and the expertise to make the changes on a meaningful scale lie in the private sector.

We have explored, and are in the process of setting up, the Renewable Energy and the Efficiency Fund, through our private sector partners, the IFC.

And that would be a fund of about $250 million, with a soft core of about $50 million grant funds, to buy down what we call the front-end costs in identifying the risks for the private sector investors of technology that will be the first of its kind on that scale in that developing country context.

Without this soft money they probably wouldn't go into those marketplaces. But we got $250 million together, about $50 million soft core, that will leverage about $1 billion of investments. And that's being set up now.

—Ken Newcombe, The World Bank

FAS Web Site Rapidly Expanding

Over the past year FAS has been pushing the envelope of cyberspace, and our efforts have been well received. Users from around the world are able to access information about the Federation, its projects, and related resources. Having been ranked in the top five percent of all web pages and being honored as featured site on several popular web search tools, the FAS web site has become a definitive source of information for many Internet users.

Publishing to the web has given FAS projects more visibility and opportunities to share their work with the media and public. The Secrecy & Government Bulletin and the Arms Sales Monitor are now read by more people via the Web than in the hard copy versions, with several hundred copies distributed each week. Web surfers who enter the ProMED homepage can instantly sign up for a global discussion group with other users to share information on emerging diseases. The Space Policy Project receives e-mail from reporters and government officials in the U.S. and as far away as the Czech Republic on a regular basis.

In one recent week, as many as 7,000 people browsed the FAS site, downloading over 22,000 separate documents. Visitors from over 40 countries have entered the webspace, from places as diverse as Germany, Singapore and Zaire. And our numbers continue to grow at about 5% per week. FAS has matched the Internet visibility of much larger groups, such as the Sierra Club, and is gaining on such international organizations as Greenpeace.

These accomplishments and contributions have not gone unnoticed by the traditional print media. Our website has been written up in specialized newsletters, such as "Inside Missile Defense" and "Government Computer News," as well as mass circulation publications such as "The Nation" and the "Los Angeles Times." And we are finding more and more "net-savvy" reporters and analysts, for whom our webpresence is a valuable resource for news and analysis.

Over the past several months we have continued to expand the content of our our site, while also significantly upgrading its appearance and ease of use. In the next few months further upgrades are planned, with added search capabilities, an expanded index, and the ability to accept credit card payments online. We believe that these innovations will further enhance the utility of our implementation, both for FAS and our diverse audiences.

We at FAS are excited about this adventure into cyberspace and hope to see you in our webspace soon! FAS can be found on the World Wide Web at <http://www.fas.org/pub/gen/fas/>. For more information, or if you have any questions, contact Mike Panetta at fas@fas.org.

FAS PUBLIC INTEREST REPORT (202) 546-3300
307 Mass. Ave., N.E., Washington, D.C. 20002
Return Postage Guaranteed
March/April 1996, Volume 49, No.2

Second Class Postage Paid at Washington, D.C.