A consensus workshop report on GLOBAL CLIMATE AND ECONOMIC DEVELOPMENT

Center for Science, Technology, and Public Policy

Hubert H. Humphrey Institute of Public Affairs
University of Minnesota

THE GLOBAL CLIMATE AND ECONOMIC DEVELOPMENT

A consensus report from the Humphrey Institute workshop series on

"Climate Change and Sustainable Development: Paths to Progress"
Workshop 1
"The Developing World: The Global Climate and Economic Development"

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FOREWORD TO

A report from the Humphrey Institute workshop series on

"Climate Change and Sustainable Development: Paths to Progress"

By

Dr. R. K. Pachauri

Chairman, Intergovernmental Panel on Climate Change (IPCC)

The report of this workshop is a very useful compilation and expression of views from a diverse group of thoughtful leaders drawn from industry, academia, officialdom and civil society. It is entirely relevant that this first workshop in a series focussed on the developing world in relation to the global climate and economic development. I think the reasons for this priority lie within several findings of the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC). Most significantly, the TAR states that " the impacts of climate change will fall disproportionately upon developing countries and the poor persons within all countries, and thereby exacerbate inequalities in health status and access to adequate food, clean water and other resources." Given that a large part of the developing world is struggling to shed the burden of persistent poverty, a discussion of the nexus between climate change and development is a major area of concern that the global community must understand and seek answers to. Global action on each of these two subjects is being pursued under the Framework Convention on Climate Change on the one hand and the Millennium Development Goals of the U.N, which target the reduction of poverty worldwide, on the other. Yet there is a grey area between these two streams of initiatives which blur the perspective on how climate change needs to be integrated with development policy and how development itself can be pursued such that mitigation of emissions of greenhouse gases (GHGs) and adaptation to the impacts of climate change can take place without burdening those hundreds of millions who are living on incomes less than a dollar a day.

The workshop report is a very useful narrative and analysis of views presented from which the editors have extracted a set of recommendations and elaboration of the next steps. These convey a balanced set of actions put forward for consideration by those in positions of importance and decision- making in both developed as well as developing countries. The universality of appeal in these recommendations lies in the fact that they do not prescribe any specific actions for any particular society, but rather convey some important conclusions that should stimulate further thought and action in fields related to development policy and climate change.

One salient feature of this document lies in the importance it places and the details it provides on the role of technology both in respect of development choices and options for mitigation and adaptation in the field of climate change. It also brings out the importance of local action that emphasises the need for robust institutions functioning at the grassroots level in developing as well as developed nations. Indeed, the challenge of climate change would require the development and dissemination of suitable technologies on a large scale across the globe.

The inevitability of considering climate change as an important dimension of future development policies and initiatives arises from the fact that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" and that "the impact of climate change is projected to have different effects within and between countries. The challenge of addressing climate change raises the important issue of equity" (IPCC TAR). We are already living in a world with enormous economic disparities, and if climate change would tend to exacerbate these, then it becomes a subject of global concern in countries of North and South. It was the Nobel laureate economist Kenneth Boulding who stated "It is doubtful whether 200 years ago the richest country had a per capita real income more than five times that of the poorest.... Today the difference between per capita income for the richest countries and for the poorest is of the order of 1 to 50 rather than 1 to 5....". There is, therefore, a stake on the part of all societies in the world to see that this widening of the gap between a minority of the earth's population, which progressively grows richer, and a much larger number that remains in poverty is narrowed with a sense of urgency. Undoubtedly, the Humphrey Institute workshop, being the first of a series, cannot provide an analysis of every facet of this major global challenge, but it has certainly accomplished quite remarkably the task of laying out a rich composite of concepts, analysis and future perspectives that no doubt deserve the attention of all those who are concerned with expanding the welfare of those who deserve healthy rates of development, as well as those who see the benefits of a healthy planet.

SUMMARY

With each passing year the world comes closer to a formal consensus on two major issues: the reality and the potential harm of climate change—global warming—induced by human activity; and the need to alleviate the human devastation and social inequity of extreme poverty.

The level of danger and specific risks associated with global warming may be debatable, but serious changes are inevitable. Although we have much to learn about how best to address the alarming rates of poverty and needs of development facing much of the world's population, the need to act is no longer debatable. Global climate-change risks and the problem of poverty have traditionally been dealt with as separate issues. These issues can no longer be dealt with independently; they need to be solved together.

This report captures the discussions and summarizes consensus themes from the workshop, "The Developing World: The Global Climate and Economic Development", hosted by the University of Minnesota's Hubert H. Humphrey Institute of Public Affairs. At this workshop, an expert group examined ways to promote economic and social development and to improve the health of populations and ecosystems while slowing greenhouse gas emissions and mitigating the impacts of climate change. The workshop's main conclusion is that development programs and policies are most likely to be successful and sustainable when they take climate change into account. Likewise, climate change mitigation and adaptation programs and polices are most viable with attention to sustainable economic development, and therefore, they should be consistent with a country's overall development framework. Climate change mitigation and adaptation and economic development are inseparable, and thinking of them together will greatly enhance our ability to meet the Millennium Development Goals (MDGs) to eradicate extreme poverty by 2015.

Other conclusions and recommendations from the workshop are as follows:

- Include climate change mitigation and adaptation as primary goals in development assistance programs. Existing programs should be redesigned to align MDGs, climate change mitigation, and economic development.

- Encourage developed countries to expand investment in assistance programs that integrate climate change mitigation and adaptation with economic development and capacity building. Projects that integrate climate change with economic development in developing counties should receive priority over those that address these challenges separately.

- Increase investments and participation in market-based mechanisms to reduce greenhouse gases (GHGs).

- Improve infrastructure to invest in climate change mitigation and adaptation along with development. Develop and expand programs and strategies to increase investment in renewable energy systems. The introduction of renewable energy into rural areas should be linked with policies that promote rural economic development.

- Take action in all countries to stabilize atmospheric concentrations of GHGs and explore options for engaging developing countries in creative ways. Developed countries are responsible for the vast majority of past emissions and have obligations to act first, yet other major emitters in the developing world must also take action.

- Integrate science and technology with issues of development in both developing and developed countries. For example, development programs and plans could consider the possibility for science and technology to contribute toward solutions for global environment and development issues.

- Invest in and enhance education and communication about climate change and sustainable development.

- Promote the development and deployment of energy efficient and low-carbon technologies.

The tasks are formidable, but attainable if we realize that the choice is not limited to either development or the environment. Both are not only possible, but they are also necessary and full of promise for synergy and new collaboration. Win-win situations exist in which new technologies can accelerate economic development while reducing greenhouse gas emissions.

As nations and civil society gather in 2005 to consider the effectiveness of efforts to reach the MDGs and eradicate extreme poverty, resources and energy can be directed toward changing the prevailing paradigm that human development has to come at the expense of the environment. The challenge and the opportunity are to find pathways forward that sustain both the environment and human progress.

I. INTRODUCTION

No scientific conclusion and few social commitments ever achieve unanimous endorsement, but inexorably, with each passing year the world comes closer to a formal consensus on two major issues: the reality and the potential harm of climate change—global warming—induced by human activity and the need to alleviate the human devastation and social inequity of extreme poverty.

In perhaps the most comprehensive, internationally coordinated, formal scientific assessment in history, the Intergovernmental Panel on Climate Change (IPCC),[1] operating under a rigorous set of procedures for the review and analysis of the evidence, has produced a series of consensus reports that assert with increasing confidence that the observed global warming of the last century has been caused largely by human activity and, if not checked, the consequences of this continuing climate change in many parts of the world will be devastating. The panel's assessment has been reinforced by many other organizations and institutions, including the National Academy of Sciences[2] and the U.S. Climate Change Program.[3]

In the year 2000, the United Nations (UN) General Assembly unanimously adopted a declaration recognizing that the benefits and costs of globalization were not distributed equitably, that it is unacceptable for more than a billion people to live in poverty, and that all nations share an obligation to work toward remedying the situation. That declaration included a pledge to meet, by 2015, what have been labeled the Millennium Development Goals (MDGs).[4] These goals address poverty, education, health, environmental preservation, and the economic development necessary to make progress in all of these areas. To implement them, it was agreed that developed countries would not only have to adjust policies, but also provide substantial funding.

Addressing these two urgent challenges—avoiding climate change damage and closing the unacceptable gap between the richest and poorest in the world—is all too often done in separate and uncoordinated efforts. A few even argue that the goals are in conflict with each other; that reducing greenhouse gas emissions must, perforce, inhibit development; or that the urgent needs of development require that concerns about climate change be ignored, or at least postponed. Choosing between development or environment, between the urgent and compelling rights and aspirations of the poorest

[1] Third Assessment Report (TAR) of the IPCC, 2001.
[2] Climate Change Science: An Analysis of Some Key Questions. Washington, DC: National Academy Press, 2001.
[3] Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Years 2004 and 2005. Washington, DC: USGPO 2004.
[4] UN Millennium Development Goals, http://www.un.org/millenniumgoals/.

people and nations, or the long-term protection of the globe we all share, is simply choosing one path to an unacceptable future over another. The consequence of endorsing this dichotomy is not only that it pits development against environment, but that it also, in effect, pits developing countries, whose need is urgent, against developed countries, which are perceived to be able to afford to pay more attention to reducing the global effects of climate change.

There is, however, another view, a view that we believe is more textured and more constructive. It is that it should be possible to identify a number of win-win situations where new technologies can accelerate economic development while reducing GHG emissions. When the use of synergetic strategies and cleaner technologies does involve incremental costs, programs should be developed to transfer the burden to countries better able to absorb the costs.

Across all three situations—win-win, benign, and resource transfer—policy choices will matter. What trade regime to adopt? What development path to pursue? What investment strategy to use? What regulatory burdens and incentives to impose? What technologies to develop or spread? What foreign assistance to provide? The choices made in coming years can have a direct and discernable effect on both the rate of economic development and the rate of GHG emissions the world experiences. The challenge is to find pathways forward that sustain both the environment and the rate of human progress and development.

In this context, a group of experts[5] came together at the Humphrey Institute of the University of Minnesota for a two-day workshop on "The Developing World: The Global Climate and Economic Development". This workshop was the first in a series on Climate Change and Economic Development: Sustainable Paths to Progress.[6] The series is designed to examine ways of promoting economic and social development, and improving the health of populations and ecosystems while slowing greenhouse gas

[5] See the appendix for list of experts who participated in consensus discussions.

[6] See http://www.hhh.umn.edu/centers/stpp/pathstoprogress.html for the full agenda of the first workshop and the proposal for the series. The second workshop in the series will focus on local resources in the Upper Midwest of the United States, and how this region can partner with developing countries to promote climate change mitigation and adaptation along with sustainable development. For example, University of Minnesota researchers are working on a solar-powered cooking system for areas such as Nepal, where firewood is causing pollution and people do not have access to other carbon-based cooking fuels. The third and final workshop in the series will focus on setting an international and national policy agenda to connect climate change with sustainable development.

emissions and mitigating the impacts of climate change. Its goals are to propose practical methods and programs to build consensus and overcome real and perceived barriers, and to set an agenda for the technological and institutional development needed to achieve the joint aims of development and environmental protection.

The challenge is not a trivial one. On the one hand, the realities of global warming give rise to a sobering set of statistics. Over the past century, global temperature has increased 0.6° C and is expected to continue to rise. The 1990s was the warmest decade of the century, and the number of hot days has increased while cold days and frost have decreased in all land areas during the 20th century. Glaciers have retreated during this time, and snow cover has decreased in some areas by 10 percent since 1960.[7] The Arctic continues to warm at a rate about twice as fast as the rest of the world. Scientists and Arctic residents have detected dramatic changes in the environment that have affected ecosystems and wildlife, human settlements and infrastructure, and the way of life of indigenous peoples.[8] Temperature change has also led to a geographic shift in many plant and animal populations (approximately 80 percent of those studied) and altered the timing of biological events.[9]

The IPCC predicts temperature increases anywhere from 1.4° to 5.8° C by the year 2100.[10] Such increases will have further far-reaching effects on communities, species, and ecosystems. Human activities, from the burning of fossil fuels to deforestation, have increased atmospheric concentration of CO_2 more than 30 percent since the start of the industrial revolution. It is now at a level of approximately 370 parts per million and increasing at nearly 3 parts per million by volume per year, which available evidence suggests is higher than in the past 20 million years. It will almost certainly double in the near future unless major reductions in emissions are made.[11] Although the modeling predictions range from 1.5° to 4.5° C, three leading U.S. climate models have converged on the projection that doubling atmospheric CO_2 concentrations would lead to a 2.5° to 3° C temperature change above preindustrial levels.[12] Furthermore, if climate sensitivity is nonlinear or even discontinuous, as some scientists now postulate, effects could be even greater than anticipated on local, regional, and global scales.

There is an intense international debate about what constitutes a dangerous level of global warming (Box 1). According to the IPCC, rises above 2° C will likely result in reduced crop yields in most tropical, subtropical and midlatitude regions; flooding in

[7] R.K. Pachauri, Presentation, "Climate Change and the Developing World." University of Minnesota, October 14, 2004.
[8] Pew Center for Global Climate Change. "Global Warming and the Artic—FAQs." November 2004, http://www.pewclimate.org/arctic_qa.cfm.
[9] T. Root, J. T. Price, K. R. Hall, S. H. Schneider, C. Rosenzweig, & J.A Pounds. "Fingerprints of Global Warming on Wild Animals and Plants." Nature 42: 57–60, 2003..
[10] J. T. Houghton, et al (eds) in Climate Change 2001: The Science of Climate Change. Cambridge University Press, New York, 2001.
[11] Third Assessment Report (TAR) of the IPCC, 2001.
[12] R. A. Kerr. "Three Degrees of Consensus." Science 305: 932–934, 2004.

low-lying areas; declines in food production; an increase in disease; and the extinction of plants, animals, and entire ecosystems.[13] There is fear that without dramatic action in the next few decades, the 2° C limit cannot be achieved. The European Council has agreed to set emission reduction targets to hold global warming to a 2° C limit.[14] In order to do this, it is estimated that GHGs will need to be reduced on the order of 60 percent to 80 percent, relative to 1990 levels, by the middle of this century if atmospheric stabilization is to be achieved by 2100.[15]

Box 1. The UNFCCC and a "dangerous" level of global warming

Negotiations on what became the United Nations Framework Convention on Climate Change (UNFCCC) were launched in December 1990 by the UN General Assembly. An Intergovernmental Negotiating Committee was convened to conduct these negotiations, which were concluded in just 15 months. The convention was adopted in May 1992, and opened for signature a month later at the UN Conference on Environment and Development in Rio de Janeiro, Brazil (also known as the Rio summit). It entered into force on March 21, 1994, after receiving the requisite 50 ratifications. The convention now has 186 parties and is approaching universal membership. (http://unfccc.int/cop7/briefhistory.html)

UNFCCC, Article 2, sets an ultimate objective of stabilizing greenhouse gas emissions "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." It states "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." Since the UNFCCC entered into force, there has been argument over what this level is. Significant difficulties exist in defining what impacts are dangerous, in addition to the underlying difficulties with predicting impacts over time as a result of warming. Some argue that we are already at the danger point with a 0.6° C increase, whereas others believe that the planet can adapt to much greater increases, and even indefinitely. In recent years, many organizations, experts, and countries have supported a 2° C limit to global warming. Policies and programs are being developed using this limit as a goal. The European Union has adopted this standard and is striving to cut emissions dramatically to achieve it.

[13] Third Assessment Report (TAR) of the IPCC, 2001.
[14] R. Donkers, Presentation. University of Minnesota, October 14, 2004.
[15] C. Azar & H. Rodhe. "Targets for Stabilization of Atmospheric CO_2." Science 276: 1818-1819, 1997.

The statistics and the challenge with respect to poverty and development needs are equally dismaying. More than one fifth of the world's population is in abject poverty, living on less than $1 a day, and one half lives on less than $2 a day. One fourth of the population of developing countries[16] is still illiterate. Two and a half billion people live in the world's poorest countries. These countries have an infant mortality rate of more than 10 percent (compared with just 0.6 percent in high income countries), and population growth remains high despite some evidence of slowing.[17]

Moreover, substantial evidence indicates that the impacts of climate change will be felt hardest in developing countries. Drought, flood, and accompanying increased disease are more likely in the tropical, subtropical, and littoral regions of the developing world than in the regions where developed countries are found. In addition, unlike the situation in developed countries, developing countries do not have the luxury—that is, the resources—to deal with climate change through strategies for mitigating its effects (Table 1, page 16). Thus, the developing world may have the most to lose if damaging climate change is not averted, and yet it has the least capacity on its own to shift economic development investments to climate change prevention. Add to this quandary the tension arising from the fact that the economies of the developed countries were fueled with cheap energy obtained from the oil and coal that the developing countries are now being asked to forego, or at least to use far more efficiently than have others before them.

Thus, three things seem clear. Even with measures to control population growth, the population of the developing world will grow substantially in the next half century. By the year 2050, approximately 42 percent of the world's population will reside in

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[16] This report differentiates between developing and developed countries using the World Bank classification of economies, http://www.worldbank.org/data/countryclass/countryclass.html. The World Bank has divided economies according to 2003 gross national income per capita into low income ($765 or less); middle income, subdivided into lower middle income ($766–$3,035) and upper middle income ($3,036–$9,385); and high income ($9,386 or more). Countries with low income and lower middle income economies are referred to as developing countries in this report. This financial distinction is not meant to suggest that all countries termed developing countries are experiencing similar development or that all countries termed developed countries have reached a final or ideal stage of development.
Low income economies (61):
Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, India, Kenya, Democratic Republic of Korea, Kyrgyz Republic, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Moldova, Mongolia, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Tajikistan, Tanzania, Timor-Leste, Togo, Uganda, Uzbekistan, Vietnam, Yemen, Republic of Zambia, Zimbabwe
Lower middle income economies (56):
Albania, Algeria, Armenia, Azerbaijan, Belarus, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Cape Verde, China, Colombia, Cuba, Djibouti, Dominican Republic, Ecuador, Arab Republic of Egypt, El Salvador, Fiji, Georgia, Guatemala, Guyana, Honduras, Indonesia, Islamic Republic of Iran, Iraq, Jamaica, Jordan, Kazakstan, Kiribati, Former Yugoslav Republic of Macedonia, Maldives, Marshall Islands, Federated States of Micronesia, Morocco, Namibia, Paraguay, Peru, Philippines, Romania, Russian Federation, Samoa, Serbia and Montenegro, South Africa, Sri Lanka, Suriname, Swaziland, Syrian Arab Republic, Thailand, Tonga, Tunisia, Turkey, Turkmenistan, Ukraine, Vanuatu, West Bank and Gaza

[17] United Nations. "Report of the High-Level Panel on Financing for Development," 2001, http://www.un.org/reports/financing/summary.htm.

India and China. Second, the developing world seeks, and should be encouraged and supported in seeking, to improve the standard of living of its people, which means growing its economies, and that, in turn, means increasing its energy consumption. Third, these countries will not be able to address the issues of climate change on their own, either by prevention or mitigation strategies. The commitment of developed countries, through adoption of the MDGs, must carry with it a commitment to finding development strategies that also minimize negative climate change impacts.

This workshop series is intended to contribute to this commitment. It will review what we know about methods for slowing climate change; how resources might be impacted by climate change (e.g., water and land use), and what policies and practices might reduce harm from these impacts. It will also explore courses of action to both reduce adverse climate change impacts and achieve economic development goals. As countries develop their economies, they face an array of choices that provide leverage points for advancing the agenda of environmentally sound development. Development itself may tend to increase emissions, but it also increases the ability of countries to minimize them. That is, development can make available more efficient technologies to lower the emissions per unit of production; become more sophisticated in using raw materials and primary energy sources to reduce emissions; improve its infrastructure (transportation, housing, etc.); and as it meets its most urgent needs in eliminating poverty and improving education, environmental protection will achieve a higher priority.

In the first of the workshops, reported on here, the focal points for discussion included the following questions:

- What are the challenges that developing countries face on their paths to economic development? What are their concerns and viewpoints with respect to climate change mitigation and adaptation? How do these challenges affect climate change and its potential impact on development?
- What are the megatrends shaping growth and climate change issues?
- What are the possibilities to move forward in light of these trends?
- What current programs in the developing world promote economic development while minimizing emissions and harm from climate change? What successes have they had, and what difficulties have they faced?

- How can developing countries use science and technology to spur development while reducing emissions and the adverse effects of climate change? What are the resource, institutional, and intellectual property barriers? How might they be overcome?

- What tools or collaborative programs would help develop political, social, technical, and institutional capacity to encourage economic development while mitigating and adapting to climate change?

In the course of the discussions, a consensus formed around certain themes and policy steps. This report attempts to capture the consensus. First, the report explores the MDGs and how these can be better achieved in conjunction with or through GHG reductions (Section II). The report then explores the challenges developing countries face, the roles of developed countries, and the possibilities for moving forward in equitable ways (Section III). Ideas for structuring an international system that deals with the MDGs and climate change jointly, in the same context and under the same programs and policies, are then discussed (Section IV). Finally, categories of action for this international system and national mitigation steps in both developing countries and developed countries are presented (Section V).

Above all, this report provides optimism for the future. The scenarios associated with global warming are alarming, but good choices can change our current path. We must put resources and energy into changing the idea that human progress must come at the expense of the environment. In many cases, some sacrifice and economic cost will be required to reduce GHGs while promoting economic development, particularly in the beginning. Programs and policies must have resources to get off the ground. However, eventually, the financial rewards will come. Economic development can occur with the environment and human health in mind. One can envision a positive scenario where MDGs are met, GHGs reduced, and developing countries' economies grow. Strategies can be developed to move forward in sustainable and equitable ways, given the motivation to restructure programs, policies, institutions, and, ultimately attitudes. We hope that this report makes a contribution in this direction.

TABLE 1: OVERVIEW OF ENERGY AND ENVIRONMENT SITUATIONS IN DIFFERENT COUNTRIES

(Source: R.K. Pachauri, Presentation, Climate Change and the Developing World, University of Minnesota, October 14, 2004)

	Local pollution	Energy use per capita	Cumulative contribution to global pollution	Technological & economic resources for change
OECD countries	Low	High	Very high	Very High
Economies in transition	Very high	High	High	Moderate
Developing countries	High	Low	Low	Moderate

II. MILLENNIUM DEVELOPMENT GOALS AND CLIMATE CHANGE

At a meeting of the United Nations (UN) General Assembly in the year 2000, all 191 member states adopted the Millennium Declaration to free the world of extreme poverty. These nations pledged to meet certain goals, called the Millennium Development Goals (MDGs), by the year 2015.[18] These goals include the following:

1. **Eradicate extreme poverty and hunger.**
   - Reduce by half the proportion of people living on less than a dollar a day.
   - Reduce by half the proportion of people who suffer from hunger.

2. **Achieve universal primary education.**
   - Ensure that all boys and girls complete a full course of primary schooling.

3. **Promote gender equality and empower women.**
   - Eliminate gender disparity in primary and secondary education, preferably by 2005, and at all levels by 2015.

4. **Reduce child mortality.**
   - Reduce by two thirds the mortality rate among children under five.

5. **Improve maternal mortality.**
   - Reduce by three quarters the maternal mortality rate.

6. **Combat HIV/AIDS, malaria, and other diseases.**
   - Halt and begin to reverse the spread of HIV/AIDS.
   - Halt and begin to reverse the incidence of malaria and other diseases.

7. **Ensure environmental sustainability.**
   - Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources.
   - Reduce by half the proportion of people without sustainable access to safe drinking water.
   - Achieve significant improvement in the lives of at least 100 million slum dwellers by 2020.

[18] UN Millenniium Development Goals, http://www.un.org/millenniumgoals/.

8. **Develop a global partnership for development.**
   - Develop further an open trading and financial system that is rule-based, predictable, and nondiscriminatory. Include a commitment to good governance, development, and poverty reduction—nationally and internationally.
   - Address the least developed countries' special needs. This includes tariff-free and quota-free access for their exports; enhanced debt relief for heavily indebted poor countries; cancellation of official bilateral debt; and more generous official development assistance for countries committed to poverty reduction.
   - Address the special needs of landlocked and small island developing states.
   - Deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term.
   - In cooperation with the developing countries, develop decent and productive work for youth.
   - In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.
   - In cooperation with the private sector, make available the benefits of new technologies—especially information and communications technologies.

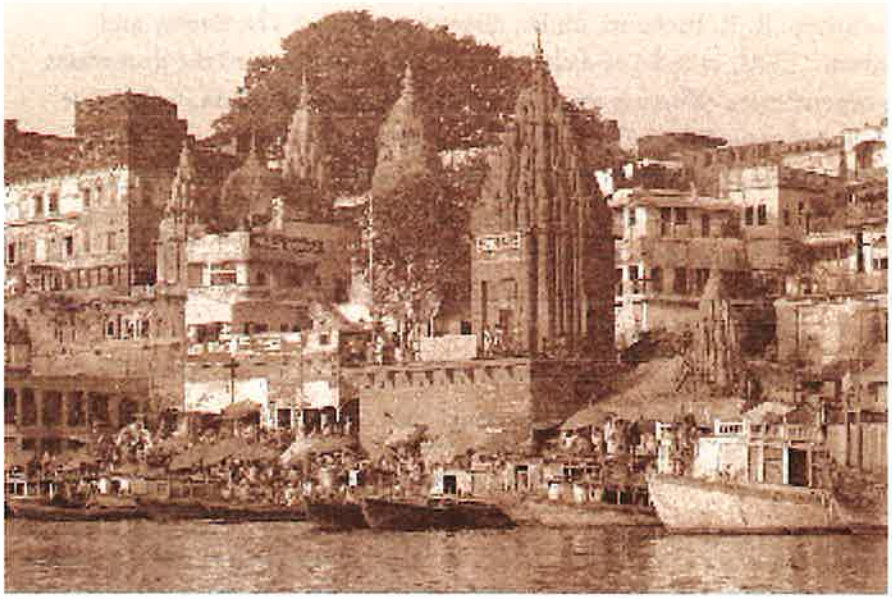
To date, significant progress has been made in meeting some MDGS, such as reducing poverty, increasing primary education and gender equality, and lowering child mortality. However, less progress has been made in fighting global disease and improving environmental sustainability.[19]

Meeting the MDGs is feasible but requires political will. In his presentation at the Humphrey workshop, R. K. Pachauri, Ph.D., director general of The Energy and Resources Institute (TERI) in India and chair of the IPCC, emphasized the distortions in worldwide expenditures. Whereas total aid in 2003 was $68.5 billion, worldwide military expenditures were $950 billion, and U.S. military expenditures were $450 billion.[20] In 2001, Mexican President Ernesto Zedillo chaired a panel that estimated that meeting the MDGs would cost Official Development Assistance[21] (ODA) programs $50 billion annually.[22] In other words, the MDGs could be met by spending less than one nineteenth what we spend on the military worldwide, and less than one ninth what we spend on military in the United States.

[19] United Nations. "Millennium Development Goals: Status 2004." Statistics Division, UN Department of Economic and Social Affairs. Produced by the UN Department of Public Information—DPI/2363-A.
[20] R. K. Pachauri, Presentation, "Climate Change and the Developing World." University of Minnesota, October 14, 2004.
[21] The United States provides approximately 0.6 percent of its annual budget for Official Development Assistance (ODA) throughout the world. Each year the U.S. Congress drafts laws to direct funds to specific development priorities. Other important players in the process for determining the levels of aid throughout the world include the U.S. Department of State, the U.S. Department of Agriculture (for food assistance), and the U.S. Agency for International Development.
[22] United Nations. "Report of the High-Level Panel on Financing for Development," 2001, http://www.un.org/reports/financing/summary.htm.

Meeting the MDGs and providing assistance have not traditionally been tied to climate change mitigation and adaptation, despite the fact that climate change impacts could greatly affect our ability to meet the MDGs. Flooding, famine, and disease that result from higher GHGs and associated temperature increases have the potential to counter development efforts. The premise of the presentation by David Hales, counsel for sustainability policy at the Worldwatch Institute, became the first and primary conclusion of the workshop—**development programs and policies are most likely to be successful and sustainable when they take climate change into account. Likewise, climate change mitigation and adaptation programs and polices are most viable with attention to sustainable economic development, and therefore, they should be consistent with a country's overall development framework. Climate change mitigation and adaptation and economic development are inseparable and thinking of them together will greatly enhance our ability to meet the MDGs.**

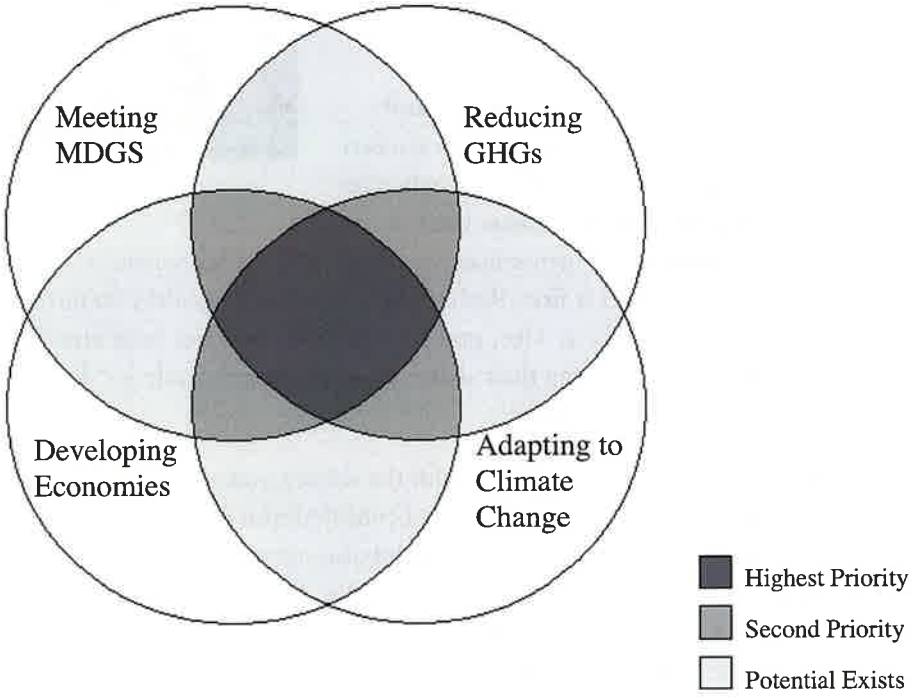
Effective climate change mitigation policies must also further equity, economic growth, and environmental quality. Opportunities to create employment or provide other economic advantages to developing countries while mitigating climate change must be exploited. The group suggested that **any future development assistance programs should include climate change mitigation and adaptation as primary goals. Existing programs should be redesigned to align MDGs, climate change mitigation, and sustainable economic development. Additionally, the systems, programs, and research should boost local economies, build capacity, and draw upon local resources in developing countries whenever possible.** A schematic for evaluating projects is illustrated in Figure 1. Increased funding and strategies to overcome barriers for such projects will be necessary to meet development and climate change challenges simultaneously.



"...development programs and policies are most likely to be successful and sustainable when they take climate change into account. Likewise, climate change mitigation and adaptation programs and polices are most viable with attention to sustainable economic development, and therefore, they should be consistent with a country's overall development framework. Climate change mitigation and adaptation and economic development are inseparable and thinking of them together will greatly enhance our ability to meet the MDGs."

FIGURE 1: INTEGRATING CLIMATE CHANGE, MDGS, AND ECONOMIC DEVELOPMENT

The diagram below illustrates the main conclusion of the consensus group. Programs and policies should be prioritized on the basis of their ability to meet the following objectives: promote economic development, reduce GHGs, allow communities to better adapt to climate change, and help meet the MDGs. Programs that achieve multiple objectives should receive the highest funding priority.



III. AT THE INTERSECTION OF THE MDGS AND CLIMATE CHANGE

Challenges, Concerns, and Viewpoints of Developing Countries

In order for the international community to effectively address the challenges of extreme poverty and climate change and to move beyond the false either-or dichotomy of environment versus development, the needs facing developing countries must be made explicit. Consensus group members identified some of the key concerns facing developing countries, several of which revolve around the "who goes first" dilemma.

Gao Pronove, executive director of the Earth Council Geneva, argued that in the face of more immediate and pressing matters, climate change is not the primary concern of developing countries. Developing countries are reluctant to engage in climate change mitigation because their principal focus is poverty reduction. Furthermore, developing countries believe it is not fair that they should be required to act first. Rather, since developed, wealthy countries caused the problem, they ought to fix it. Also, many developing countries have already ratified the Kyoto Protocol and are doing their share; the prevailing attitude is "don't ask us to do more and then abandon us again."[23]

Pronove stressed the need to be straightforward with the science and economics of climate change and promote honest debate. He urged consideration of a class model rather than a country model to address emissions. Hales also noted that not enough attention has been paid to aspects of distribution universally. Although the debate has been focused on developed countries and developing countries, there are poor and rich in every country, and more attention needs to be paid to the impacts on the poor in developed countries as well.

Hales described several challenges in the interactions among developed countries and developing countries, including a lack of trust between them and a growing perception in some developing countries that narrowly focused efforts to promote democracy are associated with increasing gaps between the rich and poor. A disconnect exists between investment and funding needs in developing countries. People in developing countries often have no insurance or savings. Because their assets are largely in their crops and homes, disasters have profound effects. Hales emphasized that in most countries, development and climate change are thought of separately and are under the purview of two separate ministries. Additionally, climate is a shared resource, which makes climate change a difficult issue for governments to tackle.

[23] G. Pronove, Presentation, "Climate Change and Sustainable Development in Developing Countries: Trick or Treat." University of Minnesota, October 14, 2004.

"In order to stabilize GHGs, all countries have to take action, especially the developed countries that are responsible for the vast majority of past emissions."

Roles of Developed Countries

The challenges do not confront only developing countries. Several reasons for developed countries to set national policies and programs to reduce GHGs were cited: it is a global duty for developed countries, as some of the largest emitters, to act; it is essential for global security; and it is necessary to avoid national disasters. The countries that emit the most GHGs are largely developed countries.[24] In 2000, the United States emitted 21 percent, the European Union 14 percent, Russia 6 percent, and Japan 4 percent. China emitted 15 percent and India 6 percent. The rest of the world emitted 34 percent of total GHGs. Additionally, developing countries will not be the only ones affected by climate change. A growing body of evidence suggests that human-induced climate change already affects health and biological systems in developed countries. For example, in the United States, individual species have shifted north or to higher altitudes, growing seasons have increased, carbon cycling and storage in the Alaskan tundra has been altered, and the frequency of fires and other forest disturbances has increased.[25]

Yet without the participation of developing countries, stabilizing GHG emissions at a safe level will be difficult. By 2025, almost 60 percent of global coal consumption will be in the Asia-Pacific, with 75 percent of increased coal demand in China and India alone.[26] In order to engage developing countries, as Frank Loy, undersecretary of state for global affairs from 1998 to 2001 and head of the U.S. delegation to the UNFCCC, emphasized, there has to be action in developed countries, and particularly in the United States.[27] **In order to stabilize GHGs, all countries have to take action, especially the developed countries that are responsible for the vast majority of past emissions.** Developed countries must contribute real resources to developing countries' efforts, but the funds should be contingent on real emission reduction programs by the developing countries, and financial support for clean energy or mitigation and adaptation efforts must be tied to poverty reduction.

Loy stated that although these "you act, we pay" strategies are important, they are not enough. He indicated that developing countries are quite understandably focused not only on getting help from developed countries, but also on the need for an equitable sharing of the effort to reduce GHG emissions. He noted that some proposals, such as reductions based on per capita emissions, would be difficult to implement in today's

[24] R. Donkers, Presentation. University of Minnesota, October 14, 2004.
[25] G. Parmesan & H. Galbraith. "Observed Impacts of Global Climate Change in the U. S." Pew Center for Global Climate Change, November 2004.
[26] J. Morgan, Presentation, "Global Perspectives: European Post-2012 Debate, Case Studies from Developing Countries, Framework for the Future." University of Minnesota, October 14, 2004.
[27] F. Loy, Keynote dinner presentation. University of Minnesota. October 14, 2004.

political climate. The most significant developed country in this dilemma is the United States. Consequently, there is a chicken-or-egg problem: it is politically difficult for the United States to act until the developing countries enact meaningful programs, but without meaningful U.S. action, the developing countries will not act.

Loy proposed that the demand that developed countries go first is both logical and can be accommodated. However, in turn, developed countries like the United States also expect that major emitters among developing countries take on some real obligations. He described a possible solution to the chicken-and-egg problem—the United States would agree to accept a meaningful, but quite moderate target or program under a mandatory scheme, and a considerably tougher target or program once the developing countries had obligated themselves to a meaningful program under such a scheme. To equitably address the stalemate, **it is important for developed countries to both act first and to link climate change mitigation to poverty reduction in developing countries.**

"...it is important for developed countries to both act first and to link climate change mitigation to poverty reduction in developing countries."

Moving Forward in Equitable Ways

While the MDGs represent the highest level of international consensus around the need to address issues of global disparity, the Kyoto Protocol represents the highest level of international consensus around the need to address climate change. In 1997, governments agreed to the Kyoto Protocol as an addition to the UNFCCC. The Kyoto Protocol, which has more powerful and legally binding measures than the UNFCCC, went into effect on February 16, 2005, for its 128 parties. However, some of the largest emitters, including the United States, are not parties. As a result, a serious question exists as to how effective the protocol can be in reducing global emissions to an acceptable level. In light of the objective of the UNFCCC, it is clear that the Kyoto Protocol is a first step, and that deeper cuts and additional decarbonization strategies are needed.

Consensus members said that equity issues not only contribute to the current stalemate, but also contain solutions for moving forward. Jennifer Morgan, director of the Worldwide Fund for Nature's Climate Change Program, posed several questions concerning the structure of future international regimes for climate change mitigation. She questioned what type and level of participation developed countries should seek from developing countries and suggested **equitable approaches to engaging developed countries and developing countries.** Basic principles would include equal access to the atmospheric commons and weight placed on per capita emissions of the country; historical responsibility; ability to pay and capacity to act; no harm to the ability of countries to achieve sustainable development objectives; and provision of resources for development in developing countries.[28] One idea put forward by Morgan was

[28] J. Morgan, Presentation, "Global Perspectives: European Post-2012 Debate, Case Studies from Developing Countries, Framework for the Future." University of Minnesota, October 14, 2004.

"...seek equitable approaches to engaging developed countries and developing countries."

that individual countries or communities might fall into three tracks: the Kyoto track, which includes mandatory caps and trading; the decarbonization track, which includes low carbon paths to development; and the adaptation track, which includes assistance programs from developed countries to developing countries for adaptation. Developed countries and a select few developing countries with resources and highest emissions would fall into the Kyoto track. Developing countries would fall into the decarbonization track. The most vulnerable developing countries, with few resources, would fall into the adaptation track.

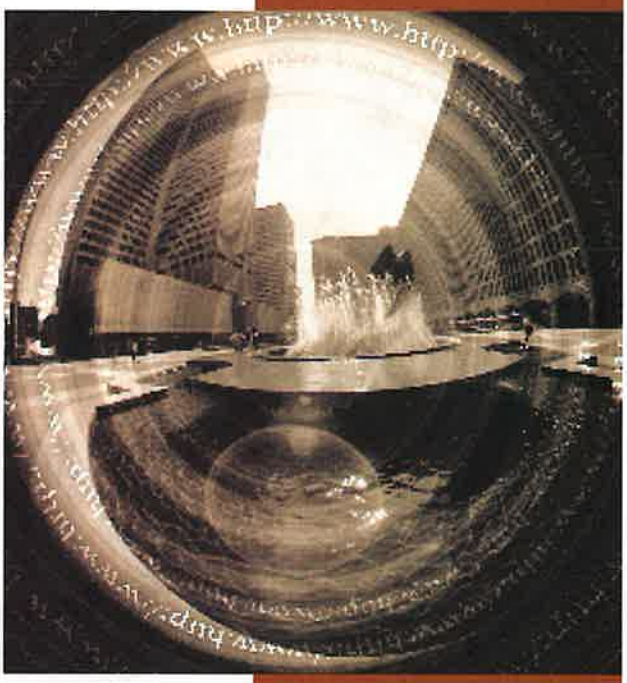
James Gustave Speth, Ph.D., dean of the Yale School of Forestry and Environmental Studies, also suggested that creative thinking on how to engage developing countries in an equitable way is needed. Some developing countries with higher per capita incomes and higher emissions might reasonably be expected to curb emissions.[29] However, poorer developing countries cannot be expected to commit to absolute reductions or act on the same timescale as developed countries and richer developing countries. In this case, Speth suggested **input based goals, such as accounting for the amount of carbon that goes into a product or development strategy, as opposed to curbing CO_2 output.**[30]

Because of a lack of universal adherence to the Kyoto Protocol, Hales suggested that, at least in the interim, developed countries should put resources into practical initiatives **that link climate change with economic development in developing countries. A "climate change bank" and a competitive bidding process should be created to allow developing countries to obtain these resources.**

Overall, more political attention to climate change and the environment is needed in developed countries. Pronove stated that climate change needs more media coverage, and **international funding should be increased to implement Article 6 of the UNFCCC on public awareness, education, and training.** In one educational project, the Earth Council has established on-line learning courses to assist in developing Clean Development Mechanism (CDM) projects.

[29] European Commission. "Action on Climate Change Post 2012: A Stakeholder Consultation on the EU's Contribution to Shaping the Future Global Climate Change Regime." 2004, http://europa.eu.int/comm/environment/climat/pdf/background_paper.pdf.
[30] G. Speth, Presentation. University of Minnesota, October 14, 2004.

The consensus group discussed other ways in which developed countries must act, for example, through increasing financial investments at home and in developing countries, changing domestic policies, transferring technology to developing countries, enhancing cooperation among developed countries, and altering behavior and consumption. Developed countries must act to regain credibility and trust in the global debate, and in particular, in the eyes of developing country communities.



Current Actions in Developed Countries

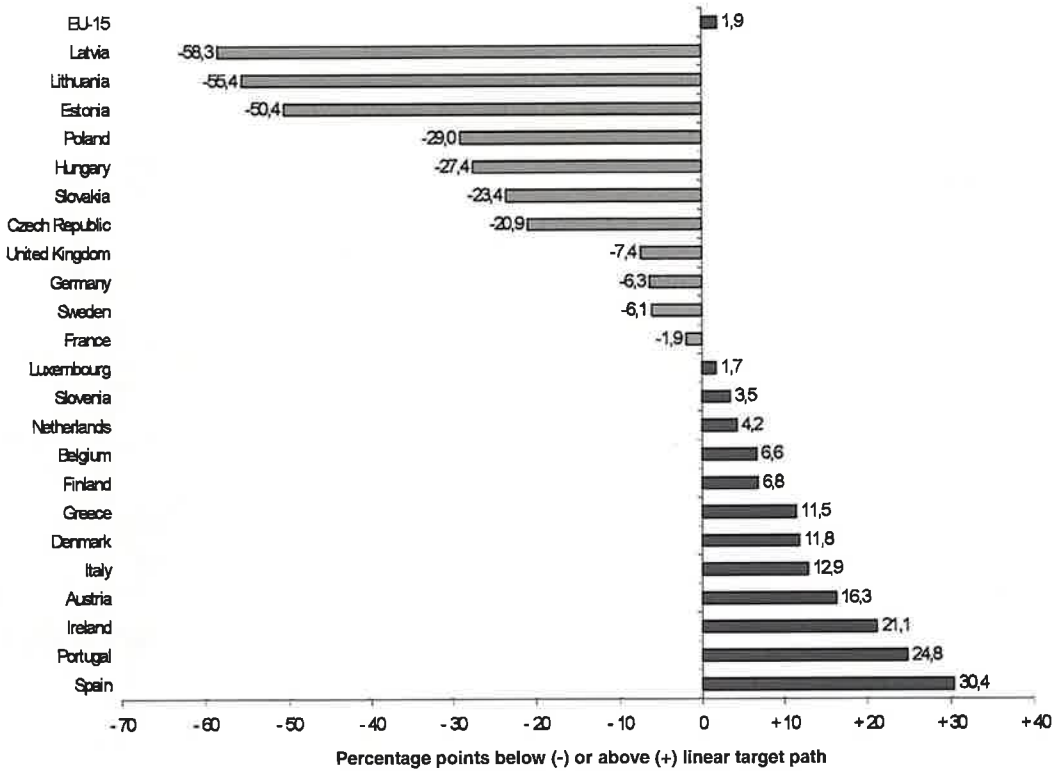
Consensus group members discussed the large commitments to reduce GHGs that several developed countries have already made. The Netherlands has pledged to reduce emissions 30 percent and Germany has pledged to reduce emissions 40 percent by 2020; by 2050, Sweden has pledged to reduce 60 percent, France 75 percent, and the United Kingdom 60 percent.[31] Robert Donkers, counselor for environmental affairs at the European Commission Delegation, spoke about mechanisms that the EU is using to curb emissions. One is the European Climate Change Programme (ECCP). The ECCP involves key stakeholders and is aimed at meeting the 8 percent reductions under the Kyoto Protocol[32] in a cost-effective way. So far, EU member states from eastern Europe have been among the most successful in reducing their emissions (Figure 2). The EU is also beginning stakeholder discussions on its post-2012 strategy, as directed by the Kyoto Protocol.

Donkers discussed the EU Emission Trading Scheme (EU ETS). In preparation for the entry into force of the Kyoto regime, on January 1, 2005, the European Union launched a domestic Emission Allowance Trading Scheme covering more than 12,000 installations in the 25 member states.[33] Under this scheme, each EU member state allocates allowances to companies, and the companies can trade surplus allowances or buy extra allowances on the market. Companies may also use credits from GHG emission reduction projects in developing countries. The EU ETS is under a trial period from 2005 to 2007 and is currently limited to CO_2 emissions from large energy users. Donkers suggested that the **EU ETS be extended to other installations and transportation, and all GHG gases.** The EU Emission Trading Scheme is set to be a cornerstone of EU climate change policy.[34]

[31] R. Donkers, Presentation. University of Minnesota, October 14, 2004.
[32] By 2010 and using 1990 levels as a baseline.
[33] R. Donkers, Presentation. University of Minnesota, October 14, 2004.
[34] European Commission. "Action on Climate Change Post 2012: A Stakeholder Consultation on the EU's Contribution to Shaping the Future Global Climate Change Regime." 2004, http://europa.eu.int/comm/environment/climat/pdf/background_paper.pdf.

FIGURE 2: HOW ARE EU COUNTRIES DOING IN REDUCING GHGS UNDER THE KYOTO AGREEMENTS?

(Source: R. Donkers, Presentation, University of Minnesota, October 14, 2004)



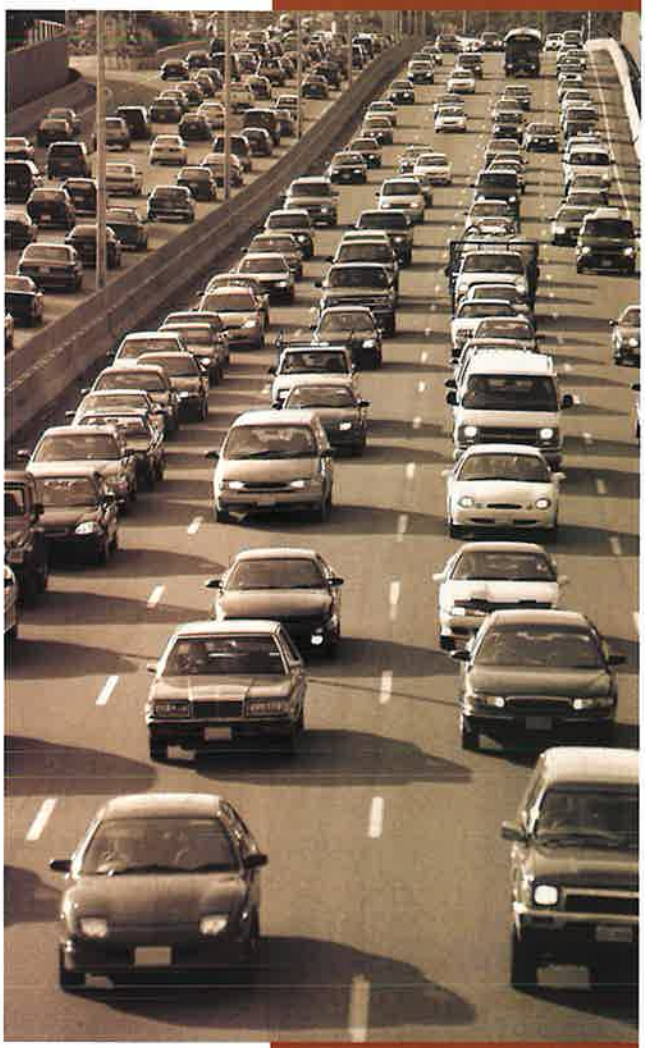
Note: The bars represent the deviation between a hypothetical target (in 2002) and what has actually been achieved (in 2002). The hypothetical target for 2002 assumes that reductions as a percentage of base year levels follows a linear path. Distance to target is expressed in percentage points.

Speth noted a startling absence of discussion about science and the environment in U.S. national politics. C. Ford Runge, Ph.D., of the Department of Applied Economics at the University of Minnesota, described three elements that would be needed to change climate change policy in the United States: commitment to a multilateral response, recognition of environment and ecology in global health, and more sustainable policies on consumptive behavior.[35] In the absence of a clear and aggressive national policy, however, various organizations can still take action. For example, the Chicago Climate Exchange is a voluntary emissions trading scheme in the United States with more than 70 public and private members.[36]

Types of Action

Table 2 illustrates the types of action possible by categorizing the flow of resources and the organizations involved. This scheme includes three types of action—those that stimulate economic development and have positive environmental and health values, those that do not hurt economic development but may improve climate change or environmental performance, and those that transfer resources in order to promote growth while also achieving environmental and health goals. The three different types of actors are characterized as public, private for-profit, and private nonprofit organizations. Though each actor has a distinct role, there is much to be gained through coordination, collaboration, or formal partnerships.

Consumers can also do their part by reducing waste and consumption of energy and products. Pachauri suggested **consumer labeling as a motivational tool.** For example, the efficiency of appliances and energy use should be stated. Life-cycle analysis labeling should inform consumers about the total GHG emissions in making and using the product. **More incentives for purchasing green energy or products are needed.**



[35] C. F. Runge, Presentation. University of Minnesota, October 14, 2004.
[36] Chicago Climate Exchange, http://www.chicagoclimateexchange.com/about/members.html.

TABLE 2. CATEGORIES OF ACTORS AND ACTIONS

	Type of Action		
Organization	Win-win[37]	Benign[38]	We pay, you act[39]
Public	▪ Policy reforms that align economic incentives with climate change mitigation or adaptation goals	▪ Research support or collaboration ▪ Technology-transfer systems	▪ Official Development Assistance (ODA) ▪ Other assistance programs ▪ Research grants ▪ Incentives for renewables ▪ Insurance programs for investments ▪ Formal technical assistance ▪ Investment in infrastructure with no payback
Private, for-profit	▪ Investments in systems or technologies that spur development and sustainability ▪ Export of products or technologies	▪ Analysis and advice ▪ Technical assistance ▪ Licensing agreements	▪ Donations ▪ Research grants ▪ Formal technical assistance
Private, nonprofit	▪ Building on-ground systems that achieve sustainable development	▪ Advocacy ▪ Analysis ▪ Informal technical assistance ▪ Participation in global organizations and programs	▪ Donation of services ▪ Training programs ▪ Foreign assistance

[37] Investments of this type accelerate economic development while mitigating GHGs.
[38] These do not retard development but may positively affect GHG emissions.
[39] This category involves a formal transfer of resources in order to compensate for the cost to developing countries–slower growth or GHG mitigation–of the strategies implemented.

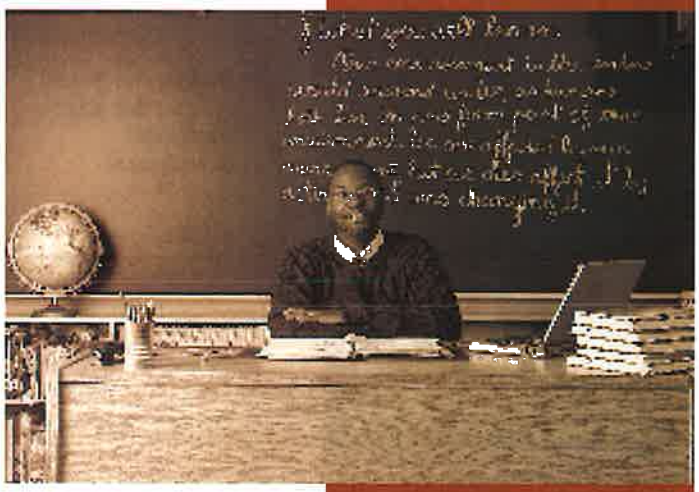
IV. STRUCTURING AN INTERNATIONAL SYSTEM TO ALIGN THE MDGS AND CLIMATE CHANGE

Current and Potential Programs

While the primary conclusion of the consensus group is that economic development and climate change mitigation can be partners, Pachauri stated that the challenges are to develop policies that will help developing countries make the transition and allow them to develop the political, social, technical, and institutional capacity to encourage economic development while mitigating and adapting to climate change.[40]

One way developed countries have traditionally been involved with economic development is through assistance to developing countries. For example, USAID began an ambitious program in 1998, known as the Climate Change Initiative (CCI). It sought to provide $1 billion over a five-year program to developing countries and nations in transition to reduce their GHG emissions or increase their adaptive capacity while promoting economic development.[41] CCI supported work on human and institutional capacity building, policy reform for market transformation and sector restructuring, technology cooperation, public-private partnerships, demonstration projects, and credit enhancements. Some project examples include funding solar battery systems to electrify households in remote communities in the Philippines; supporting technology transfer systems between the United States and India; helping to conserve rainforests in Belize, Africa, and Brazil; building energy efficient homes in South Africa; sponsoring exchanges in Indonesia to build local knowledge and capacity for preserving the country's coastal resources; helping El Salvador cope with severe weather events through management tools; and promoting best agricultural practices in Mali to help farmers address the harsh conditions and reduce their vulnerability to potential impacts from climate change. The workshop highlighted **the need for developed countries to continue to invest in assistance programs that incorporate climate change mitigation and adaptation strategies into economic development and capacity-building programs.**

"...developed countries need to continue to invest in assistance programs that incorporate climate change mitigation and adaptation strategies into economic development and capacity-building programs."



Currently available renewable energy technologies can allow developing countries to build upon local resources. For example, the government of India has an active policy to harness wind power. India ranks fifth in the world for wind power installation.[42] Globally, if we harness technology to extract 10 percent of potential wind energy, we could comfortably

[40] R. K. Pachauri, Presentation, "Climate Change and the Developing World." University of Minnesota, October 14, 2004.
[41] USAID. "Making a Difference in People's Lives: USAID's Climate Change Initiative 1998–2002." http://www.usaid.gov/our_work/environment/climate/docs/GCC9301.pdf
[42] TERI (The Energy and Resources Institute). "Blow, Winds, Blow." March, 2001, http://www.teriin.org/energy/wind.htm.

"...integrate assistance programs with technology transfer and incentives for grassroots renewable energy efforts."

meet the world's energy requirements from that source alone. In another example, women in India are using the sun's energy to churn butter with automated photovoltaic (PV) systems.[43] Countless hours spent churning butter by hand in rural regions have been freed up, allowing more time for other work and family. In this case, technology has improved people's lives, and economic development was possible without increasing GHG emissions.

Both assistance and technology development are important, and a future international framework to integrate climate change with sustainable development needs to integrate assistance programs with technology transfer and incentives for grassroots renewable energy efforts. For example, the Global Environment Facility (GEF) encourages investments in renewable technologies by covering the incremental costs of projects. This specialized fund is an independent financial organization that provides grants to developing countries for projects that benefit the global environment and promote sustainable livelihoods in local communities. GEF funds are contributed by donor countries and managed by the UN Environment Programme, the UN Development Programme, and the World Bank.[44] **Projects that focus on rural needs, such as improved cooking fuels, grid access, and distributed generation and use should be expanded.**

Until recently, investments in climate change mitigation and adaptation have been depressed due to a lack of reliable developers, regulatory risk, and data uncertainties. Specifically, investing in renewable technologies and climate change mitigation systems poses a high level of risk. Karen McClellan, director of investment for the Climate Investment Partnership, stressed that risk mitigation instruments such as off-taker insurance could improve the investment climate for renewable energy in the developing world. Although private investors are increasingly aware of the vast renewable energy potential that lies outside Europe, Australia, and the United States, capital providers still overestimate the risks of such investments. Foreign banks often hesitate to lend to project developers of clean energy projects, even against strong power purchase agreements, although in some countries such as India, the local capital markets are beginning to close the financing gap.

Strong project developers who can operate locally and also effectively tap the international capital markets are rare. McClellan cautioned that current financial programs in international loans, export credit guarantees, and grant facilities generally

[43] R. K. Pachauri, Presentation, "Climate Change and the Developing World." University of Minnesota, October 14, 2004.
[44] Global Environment Facility. "About the GEF," http://www.gefweb.org/What_is_the_GEF/what_is_the_gef.html.

favor investments in fossil-fuel-intensive energy infrastructure.[45] One new development is the growing interest in carbon finance. The Clean Development Mechanism (CDM), one of the Kyoto Protocol's market mechanisms, is slowly taking off. The CDM allows clean energy project developers in emerging markets to sell emission reductions forward to buyers seeking compliance instruments, thereby creating an extra source of cash flow, reducing risk, and improving returns. Joint Implementation (JI) is the other project-based mechanism of the Kyoto Protocol. Under JI, emissions reduction units are earned for projects undertaken in countries with binding emissions targets. Barriers to implementing the CDM and JI incentives, both economic and ideological, should be minimized. Desire to use CDM and JI incentives to stimulate incoming investments is driving many governments to improve their regulatory environments for clean energy projects.

The higher risk and lack of qualified financing experts forces recipients of grants or assistance to commit to carbon-intensive paths. Current mechanisms such as CDM and JI do not seem sufficient for overcoming these barriers. **Pronove noted that there are large investment streams in some developing countries already, and MDGs and climate change mitigation strategies need to be incorporated into those existing investments.** Insurance companies should recognize the greater risks posed by conventional energy systems because health and environmental problems worsen with increased emissions.

The potential exists for **market-based mechanisms to provide exciting paths for achieving GHG reductions along with sustainable development.** Several approaches have been developed to accumulate and delegate the funding required to implement renewable energy and sustainable development projects. These include green energy quotas, long-term take or pay agreements (contractual obligations to buy from renewable energy sources), tax incentives, and subsidized leases on government land. McClellan's organization, the Climate Investment Partnership, pulls together funds from many different sources and invests in GHG reduction projects throughout the world. The greatest potential for these investments exists in countries like China, India, Brazil, Chile, Mexico, Korea, Thailand, and the Philippines, where conditions favor strong markets. Among those conditions are a large and growing energy demand, a centralized power sector, healthy start-up growth rates and returns, increasing environmental awareness, the existence of relevant national or local policies, and the ability to use CDM benefits.[46] In many countries and projects, rates of return

[45] European Commission. "Action on Climate Change Post 2012: A Stakeholder Consultation on the EU's Contribution to Shaping the Future Global Climate Change Regime." 2004, http://europa.eu.int/comm/environment/climat/pdf/background_paper.pdf.

[46] K. McClellan, Presentation, "Financing Carbon Reduction in Emerging Markets." University of Minnesota, October 14, 2004.

"...one size does not fit all--a mixture of mitigation and adaptation policies is needed, as well as a mixture of targets, timetables, technologies, and policies."

"...science and scientific collaboration should be mainstreamed with issues of development."

on investments are between 15 and 20 percent. McClellan described the example of financing for a project in India to make concrete blocks from solar energy instead of coal. The project entrepreneurs received loans and capital that they will repay with their carbon credits. The new technology is leading to job creation and multiple environmental benefits.

Donkers described the Johannesburg Renewable Energy Coalition (JREC), which was established at the 2002 World Summit on Sustainable Development in Johannesburg.[47] It includes 80 countries that have agreed to increase their renewable energy use through concrete targets and deadlines. Donkers also supported the idea that project-based approaches might be preferable in the absence of universal adherence to global treaties. JREC takes a project-based approach, instead of a treaty or consensus approach. JREC focuses on strategies to promote the use of renewables in different countries and regions, including increasing investments and developing markets. Donkers suggested that, in the post-2012 period, several mechanisms be used to reengage partners and build a broad coalition among developed countries and developing countries that goes beyond the Kyoto framework. He stressed that **one size does not fit all--a mixture of mitigation and adaptation policies is needed, as well as a mixture of targets, timetables, technologies, and policies.**

The Role of Science and Technology

Although the majority of technological progress occurs in developed countries, technology must be adapted to meet local needs in developing countries. Partnerships between developed countries and developing countries can help build greater expertise and institutions in developing countries for technology development and implementation.

Pachauri argued that joint technology development and commercialization between developed countries and developing countries should be a cornerstone of development policy, and **technology transfer systems should be created and facilitated within development strategies.** Such technological empowerment involves training the poor to take full advantage of and use information, renewable energy technologies, and agricultural biotechnologies. He stated that **science and scientific collaboration should be mainstreamed with issues of development.** Armin Rosencranz, Ph.D., founder of Pacific Environment and consulting professor of biology at Stanford University, noted that trade and intellectual property barriers need to be removed so that clean energy and other sustainable technologies can be transferred and can flourish.[48] Current technology transfer infrastructure is inadequate. **Capacity building in developing countries, creating a well-trained workforce, designing efficient institutions, and providing appropriate and affordable technologies are all essential.**

[47] R. Donkers, Presentation. University of Minnesota, October 14, 2004.
[48] A. Rosencranz, Presentation. University of Minnesota, October 14, 2004.

Synergy is possible. Small-scale and locally managed renewable and clean energy technology can help reduce global emissions and meet the energy needs of rural communities, while reducing local pollutants and dependence on imported fuels. For example, the Philippines recently passed a renewable energy bill to promote the development, use and commercialization of renewable energy from local resources, such as wind, solar, biomass, and hydro.[49] One local community, Panay Island, rejected a coal power plant and is taking a local stakeholder approach to planning its energy needs by drawing on local resources. A wind farm is currently under development. This renewable energy system will not only spur economic development, but also improve the health of the local community relative to a coal-burning system, which can emit harmful chemicals and GHGs.

Morgan stressed that "on-the-ground" issues are often drivers for success, and stakeholders at the local level are the key actors. China has committed to increase installed renewable energy generating capacity to about 60 gigawatts by 2010, or 10 percent of its total power capacity. It has also adopted fuel economy standards, exceeding those of the United States by two miles per gallon. India has an aggressive wind program. The main policy drivers in these countries are increasing consumer demands for clean, fair, and cheap energy; energy security; reduced import bills; and rural access to energy. These drivers ultimately reduce GHG emissions while contributing to key major economic goals. Therefore, **a framework for the future should draw upon the power of local communities to choose or change their own paths. Developing countries should incorporate sustainable development goals and climate change mitigation into their Poverty Reduction Strategies (PRSPs).**[50] Above all, however, developing countries should not be asked to impede their growth to mitigate climate change. There are many ways for developing countries to grow and mitigate climate change at the same time.

Robbin Johnson, senior vice president for corporate affairs at Cargill, described the use of bioprocessing as a technology tool. Bioprocessing can be used to harness agriculture to replace petroleum in energy or chemical feedstock applications, removing net carbon emissions. A more open global farm economy would enable land-intensive crops to be grown in regions with ample land and water resources and labor-intensive crops to be produced in more densely populated regions, with trade among these regions promoting faster economic development and greater resource conservation.[51]

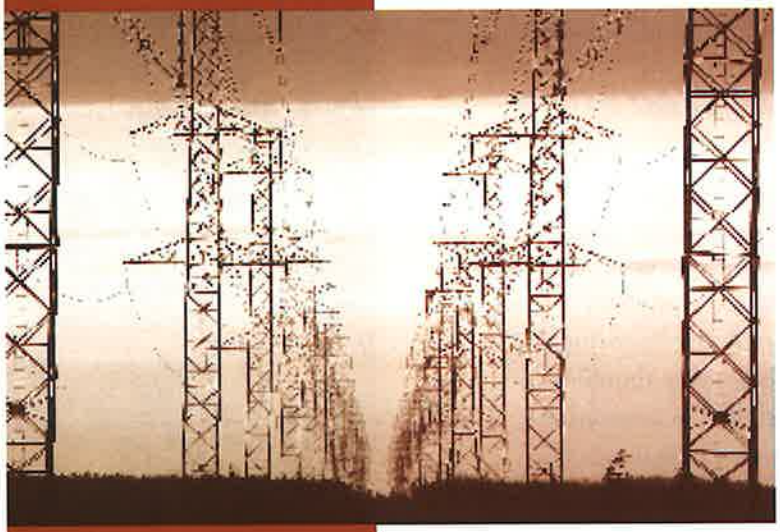
"Capacity building in developing countries, creating a well-trained workforce, designing efficient institutions, and providing appropriate and affordable technologies are all essential."

[49] J. Morgan, Presentation, "Global Perspectives: European Post-2012 Debate, Case Studies from Developing Countries, Framework for the Future." University of Minnesota, October 14, 2004.
[50] Poverty Reduction Strategy Papers (PRSP) describe a country's macroeconomic, structural, and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs. PRSPs are prepared by governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund (IMF).
[51] R. Johnson, Presentation. University of Minnesota, October 14, 2004.

"...invest in broad-based energy research and development that can be shared with developing countries."

Governments in developed countries have important roles to play in restructuring their energy systems. **Regulations should guarantee access to the grid for renewables. Governments should put transparent and efficient procedures in place for obtaining the necessary permits.** This would encourage more investment in renewable energy systems. Governments can also advance renewables by creating demand. For example, a government can purchase renewable energy on a large scale for its own use. This would provide some stability in the marketplace and reduce perceived risk for investors, as well as set an example. Greater cooperation among developed countries is also needed--**developed countries need to construct a common path.** For example, OECD countries should agree upon common GHG reduction and renewable energy adoption goals.

Rosencranz suggested **a large-scale restructuring of the energy sector** and stated that only miniscule amounts of electric utility funds are spent on research and development.[52] **Developed countries need to invest in broad-based energy research and development that can be shared with developing countries.** He also suggested that clean coal technologies with carbon capture and storage are possibilities likely to be considered for future energy scenarios. Donkers identified other important elements for reaching global goals: **investments in research and development for new technologies, significant and urgent increase of renewable energy, and changes in behavior in developed countries.** Perhaps the most important thing that developed countries can do is base their own energy use and development on renewables. For this, more work is needed on distributed generation systems and hooking up local energy resources to the electric grid. Initial investments need to be made, but overall there will be economic rewards. Investments in new technologies and systems will lead to positive economic development. For example, in the United Kingdom, it is projected that reducing emissions to the 60 percent target by 2050 will triple the GDP. Energy efficiency, conservation, and carbon sequestration should also be part of carbon reduction strategies, research, and technology development in developed countries.



One outcome from this first workshop was **an agreement to conduct a parallel scenario-building project in the Midwest region of the United States and in India. This project will explore how large reductions in GHGs (e.g., 80 percent) can be achieved by mid-century in both a developed and a developing country.** With the right technology, learning and sharing can take place in real time between these two projects and the lessons can be used to inform similar collaborative activities.[53]

[52] A. Rosencranz, Presentation. University of Minnesota. October 14, 2004.
[53] The results of this joint scenario building exercise will be highlighted at the second workshop in the series.

Building an International System

Several workshop participants shared ideas for changing or creating institutions, programs, or mechanisms in order to begin structuring an international system that deals jointly with climate change and economic development. Pachauri urged that we revamp the global energy system to enable appropriate cuts in GHGs to occur while economies develop. To do so, **he suggested greater participation in such market-based mechanisms as CDM projects.**[54] Under the Kyto Protocol, Annex I countries[55] are required to reduce their GHG emissions below their 1990 levels. CDM enables these countries to meet their reduction commitments by allowing public or private sector entities to invest in GHG mitigation projects in developing countries. In return, the investors receive certified emission reductions (CERs), which they can use to meet their targets under the Kyoto Protocol. The rationale of the program is that cutting GHG emissions in any part of the world will contribute to reducing global atmospheric concentrations.

Because the United States withdrew from the Kyoto Protocol framework, the demand for CDM projects, and hence the potential price for carbon credits, is much lower than expected.[56] Furthermore, the registration of CDM projects has been slow. Rosencranz noted that only three minor projects have gained approval through CDM, and that **procedures for approving projects need to be streamlined.** In fact, the first CDM project was not fully registered until November 2004. This project will reduce emissions of methane from a landfill in the state of Rio de Janeiro, Brazil.[57] In the last three years several OECD governments and multilateral financial institutions have established carbon funds to purchase Kyoto-eligible carbon credits. Resources available via these early stage vehicles now exceed $2 billion US. Pachauri indicated that **financing CDM projects that provide local benefits and achieve development objectives should be of highest priority. Furthermore, strategies to attract CDM investment in appropriate technologies should be developed.** He noted that climate change is being built into World Bank development strategies for India. This needs to be done globally—**the World Bank and other multilateral institutions need to consider climate change mitigation and adaptation alongside their support for economic development.**

"...the World Bank and other multilateral institutions need to consider climate change mitigation and adaptation alongside their support for economic development."

[54] The CDM is a market-based system introduced under the Kyoto Protocol to the UNFCCC. In 1992 at the Rio Summit, countries joined an international treaty--the United Nations Framework Convention on Climate Change -- to begin to consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable. In 1997, governments agreed to an addition to the treaty, called the Kyoto Protocol, which has more powerful (and legally binding) measures. And, since 1988, an Intergovernmental Panel on Climate Change has reviewed scientific research and provided governments with summaries and advice on climate problems. http://unfccc.int/essential_background/items/2877.php

[55] Developed countries and economies in transition.

[56] Ulka Kelkar and Sujata Gupta. "Clean Development: Mechanisms and Opportunities." ENCoRE, Issue 4, November 2001, http://www.teriin.org/climate/vpencorecdm.htm.

[57] UNFCCC press release, November 18, 2004, http://unfccc.int/files/press/news_room/press_releases_and_advisories/application/pdf/press041118_cdm.pdf.

"...national and international efforts are needed to create renewable energy markets where individual households, small businesses, and communities can play a role in local financing."

Speth encouraged a shift from a project-to-project basis to a sector emphasis (for example, transportation systems or power sectors) in both developing countries and developed countries. Speth also endorsed a "climate bank" akin to the World Bank, and he urged that **the World Bank should get more serious about climate change and incorporate it into its programs. An increasing share of ODA should be used for development of capacity to address issues related to energy for sustainable development.**

Financing options for climate change mitigation and adaptation projects include dedicated funds, bundling of investments with services, and customer-based investments. Integrated financing is needed—strategies should address the needs of both energy suppliers and consumers in a balanced manner. In developing countries, small-scale credit to micro enterprises has had considerable success in both promoting renewable energy use and meeting poverty reduction goals.[58] Consumer financing mechanisms to help pay for renewable energy services have also been important. Grassroots efforts will help to build local capacity and keep financial rewards in local communities. In this light, **national and international efforts are needed to create renewable energy markets where individual households, small businesses, and communities can play a role in local financing. Generally, the introduction of renewable energy into rural areas should be linked to policies that promote rural economic development.**

Developed countries, particularly the United States, can take several other actions to promote their own development based on renewables. They can **formulate clear policy goals and targets for the use of renewables and encourage investment by establishing a level playing field—either by creating incentives for their use or removing subsidies for fossil-based fuels, or both.** Global subsidies for conventional energy technologies are estimated to be over $200 billion a year.[59] Currently, most renewable energy systems are seen as expensive.[60] However, health and environmental costs of conventional energy systems are not reflected in the market. If one includes external costs to the environment and human health, renewable energy systems provide greater overall societal and economic benefits. The general public is largely unaware of the full costs to society and the environment of nonrenewable sources. Therefore, **full-cost accounting studies of renewable energy technologies, in comparison to fossil fuels, are needed, and the results should be widely dispersed to policy makers and the public.** Public education is essential for making a transition to renewable sources.

"formulate clear policy goals and targets for the use of renewables and encourage investment by establishing a level playing field"

[58] Conference Report. "Outcomes and Documentation-- Political Declaration/Policy Recommendations for Renewable Energies". Renewables 2004—International Conference for Renewable Energies, June 1–4, 2004. Bonn, Germany.
[59] Conference Report. "Outcomes and Documentation-- Political Declaration/Policy Recommendations for Renewable Energies". Renewables 2004—International Conference for Renewable Energies, June 1–4, 2004. Bonn, Germany.
[60] Wind energy is becoming increasingly economical and on par with fossil-fuel based energy, which is around 2¢ per kilowatt hour in the United States.

V. RECOMMENDATIONS AND NEXT STEPS

The following conclusions and recommendations are based on the discussions at the workshop and among the consensus group participants.[61] If these steps are taken seriously and acted upon at local, national, and global levels, we have time to change the current course and improve our societies and ecosystems.

- **Development programs and policies are most likely to be successful and sustainable when they take climate change into account. Likewise, climate change mitigation and adaptation programs and polices are most viable with attention to sustainable economic development, and therefore, they should be consistent with a country's overall development framework. Climate change mitigation and adaptation and economic development are inseparable, and thinking of them together will greatly enhance our ability to meet the MDGs.**

- **All development assistance programs should regard climate change as one of the variables of consideration.**

  - Climate change mitigation and adaptation should be linked to poverty reduction in developing countries.

  - A future international framework for integrating climate change with sustainable development needs to link assistance programs with technology transfer and incentives for grassroots energy-efficiency and renewable energy efforts.

- **Developed countries should expand investment in assistance programs that integrate climate change mitigation and adaptation with economic development and capacity building. Projects that link climate change with economic development in developing countries should receive priority over those that address these challenges separately.**

  - There should be a climate change bank and a competitive bidding process for developing countries to obtain these resources.

  - The World Bank should get more serious about climate change and incorporate investments in mitigation and adaptation into its programs.

  - An increasing share of ODA should be used for developing capacity to address issues related to energy for sustainable development.

  - Projects that focus on rural needs, such as improved cooking fuels, grid access, and distributed generation and use, should be expanded.

[61] Those listed in the appendix.

- **In order to stabilize GHGs, all countries have to take action, especially developed countries that are responsible for the vast majority of past emissions. It is important for developed countries to act first.**

  - Certain developed countries must act to regain credibility and trust in the global debate, and in particular, in the eyes of developing country communities.

  - Developed countries should act by increasing financial investments at home and in developing countries, changing domestic policies, transferring technology to developing countries, and enhancing cooperation among developed countries.

  - Developed countries need to establish a common path with developing countries. Developed countries must contribute real resources to developing countries' efforts, but the funds should be contingent on real emission reduction programs by the developing countries, and financial support for clean energy or mitigation and adaptation efforts must be tied to poverty reduction.

  - Developed countries should invest in research and development for new technologies, increase their renewable energy use immediately, and change their own consumption behavior.

  - Developed countries should formulate clear policy goals and targets for the use of renewables.

  - Developed countries should encourage investment by establishing a level playing field for renewables—either by creating incentives for their use or removing subsidies for fossil-based fuel, or both.

  - Developed countries need large-scale restructuring of their energy sectors. For example, regulations should guarantee access to the grid for renewables. Governments can put transparent and efficient procedures in place for obtaining the necessary permits.

  - Developed country governments can create a demand for renewables by purchasing renewable energy on a large scale for their own use.

  - More political attention to climate change and the environment is needed in developed countries.

  - Developed country consumers can do their part by reducing waste and consumption of energy and products. Life-cycle analysis labeling should inform consumers about the total GHG emissions in making and using the product. More incentives for purchasing green energy or products are needed.

- **Creative thinking on how to engage developing countries in an equitable way is needed.**

  - Input-based goals, such as accounting for the amount of carbon that goes into a product or development strategy, as opposed to curbing CO_2 output, is an option.

  - Basic principles of an equity system would be equal access to the atmospheric commons and weight placed on the per capita emissions of the country; historical responsibility; ability to pay and the capacity to act; no harm to the ability of countries to achieve sustainable development objectives; and developed country provisions of resources for development in developing countries.

  - A mixture of mitigation and adaptation policies and a mixture of targets, timetables, technologies, and policies are needed, because one size does not fit all.

- **More attention needs to be paid to the impacts on the poor, in both developing countries and developed countries.**

- **Investments and participation in market-based mechanisms need to be increased.**

  - The financing of CDM projects that provide local benefits and achieve development objectives should be of highest priority.

  - Strategies to attract CDM investment in appropriate technologies should be developed.

  - Additional investment capital for climate-friendly projects could be mobilized through the capital markets, for example, by securitizing pools of CDM contracts, which are cash-based.

  - Procedures for approving CDM and GEF projects need to be streamlined.

  - EU ETS should eventually be extended to other installations and transportation, and all GHG gases.

  - Participation in emission trading schemes should be encouraged in the absence of other national targets or policy goals in the United States. Some U.S. states are exploring participation in the EU ETS or the Chicago Climate Exchange.

- **Strategies and programs to increase investment in renewable energy systems are needed.**

  - Risk to investors needs to be reduced. This could be done through project finance insurance from World Bank organizations, but might also happen as local regulations that favor clean energy are put in place, energy markets are deregulated, local capital markets become more mature, and risk perception becomes more closely correlated with reality.

  - Government should assist in providing insurance to reduce investor risk.

  - Large investment streams already go to many developing countries—MDGs and climate change mitigation strategies should be incorporated into those investments.

- **The introduction of renewable energy into rural areas should be linked with policies that promote rural economic development.**

  - National and international efforts are needed to create renewable energy markets where individual households, small businesses, and communities can play a role in local financing.

  - A framework for the future should draw upon the power of local communities to choose or change their own paths.

  - Developing countries should incorporate sustainable development goals and climate change mitigation into their PRSPs.

  - The systems, programs, and research should boost local economies, build capacity, and draw upon local resources in developing countries whenever possible.

- **Science and technology should be mainstreamed with issues of development in both developing countries and developed countries.**

  - International systems for technology transfer should be created and facilitated.

  - Technological empowerment—training the poor to take full advantage of and use information and renewable energy technologies, energy efficiency, and agricultural biotechnologies—needs to be supported.

- Biomass energy systems should be modernized in developing countries.

- Trade and intellectual property barriers need to be removed so that clean energy and other sustainable technologies can be transferred and flourish.

- Investments in programs that capitalize on the synergies between technology transfer for renewables, building capacity in local communities, and increasing economic development are needed.

- More work is needed on distributed generation systems and hooking up local energy resources to the electric grid.

- Energy efficiency and conservation and carbon sequestration should also be part of carbon reduction strategies, research, and technology development.

- Developed countries need to invest in broad-based energy research and development that can be shared with developing countries.

- Bioprocessing technology should be used to harness agriculture for energy and products in developed countries and developing countries.

- Full-cost accounting studies of renewable energy technologies, in comparison to fossil fuels, are needed, and the results should be widely dispersed to policy makers and the public.

- **Education and communication about climate change and sustainable development need investments and enhancement.**

  - All parties and experts need to be straightforward about the science and economics of climate change and promote honest debate.

  - Climate change needs more media coverage, and international funding should be increased to implement Article 6 of the UNFCCC on public awareness, education, and training.

In addition to the above recommendations, criteria for assessing programs, policies, and mechanisms were suggested. Box 3 is a start for doing so.

Box 3: Criteria for Assessing Policies and Programs

To what degree does the policy or program

- boost local economies in developing countries?
- employ local workers?
- improve local environments?
- minimize or reduce GHGs?
- enhance adaptation potential of communities?
- draw upon local resources?
- lead to new or improved capacities in developing countries?
- incorporate principles of equity?
- harness the potential of new technology, as appropriate?

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[62] The opinions and recommendations expressed in this report do not necessarily reflect the positions of the organizations with which the members of the consensus group are affiliated.

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