

# **Report on Plenaries and Selected Panels**

## **Open Meeting of the Human Dimensions of Global Environmental Change Research Community**



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## Public Lecture

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### **Barbara Goebel, Executive Director, International Human Dimensions Program (IHDP), Germany**

Barbara Goebel shared her social science perspective on the challenges facing human dimension research. “Planet Earth is a difficult system,” she said, noting that while some organizations are developing strategies that have created societal awareness of global environmental change, they have been less successful in communicating the consequences. But how does one translate uncertain information into action? She said that, traditionally, society has expected scientists to organize complex systems and provide tools for dealing with nature. And therein lies a challenge: “How do we take societal perspective and expectation into account?” she asked.

Goebel emphasized that global change cannot be understood in terms of simple cause and effect paradigms. “These multidimensional changes are difficult to understand and even more difficult to predict.” What is happening now is unprecedented, she said, pointing to well established increases in anthropogenic nitrogen fixation, CO<sub>2</sub>, and temperature. “There is an interesting pattern here,” she noted, highlighting the lack of data for the social science aspect. Global change research must be designed in an interdisciplinary way, with multifaceted questions demanding interdisciplinary answers. Furthermore, close cooperation between the social and natural sciences must be deeply embedded. Human dimensions have now become central to research questions. No one toolbox can analyze human dimension needs—a variety of toolboxes are needed.

Noting that global change is a driver for framing research questions, Goebel remarked that funders often look at global change programs as prototypes for this type of research. Furthermore, an integrative structure such as research networks is necessary. This allows for bottom-up approaches and low transaction costs while encouraging trust among the agencies and parties involved. Goebel cautioned, however, that research networks are embedded in landscapes of power and closed groups can develop. Network analysis can also be employed to analyze strengths and weaknesses and can enable dialogue between global and national /local agendas.

She then outlined IHDP’s core projects encompassing environment and human security and integrated with crosscutting questions of vulnerability, governance, thresholds, and transition/learning. IHDP has many complementary frameworks including a third layer—the Earth System Science Partnership, which focuses on policies and high impact projects such as the carbon issue.

Goebel observed that there are a number of challenges for human dimension research including the development of effective, integrative research design means as well as a “more creative language that reaches out to other disciplines, paradigms, and thematic areas of social science.” North-South and South-South dialogue must also be fostered and the South must have a role in designing solutions. Research insight must be reframed into a development context, dialogues must be established with different stakeholder

groups and scientific knowledge must be translated into action. Goebel concluded that knowledge brokers are needed, something there is no a platform for yet.

## **Questions and Comments**

The moderator asked how scientists could facilitate the flow of information to institutions. Goebel replied that this is difficult when agendas are set by the natural sciences despite insufficient data for the social science “boxes,” which have to be opened to accommodate social science data or a new interface must be found.

An audience member commented that knowledge brokers are critical if the information is to reach the population. How can we achieve this as scientists? Goebel agreed that researchers are poor at communicating. Information must be digestible to the targeted audience (for example, policy makers).

A participant asked if IHDP was a consequence of an intentional framework of network building. Goebel replied that while this was not the case, IHDP was now at the point where these networks can be developed, noting, “if you start too early you have a shopping list but no linkages. If too late, you have no impact.” One audience member indicated that attention should be directed to dialogue between transitional countries. Goebel agreed with the speaker and further noted that dialogue with the Arabic world was entirely missing.

Another attendee noted that perception and different cultures—among other factors—are important in developing the right frameworks and appropriate methodology. In reply, Goebel replied by asking if capacity building should include making alliances with organizations that have expertise or should IHDP do this. The attendee considered alliances key with the right partner/s identified in a country. Teamwork is also important.

## **Plenary Session: Poverty, Environment, and Development**

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**Moderator: Mr. Alex de Sherbinin, CIESIN, Columbia University, United States**

**Dr. David Runnalls, President, International Institute of Sustainable Development (IISD), Canada**

After welcoming remarks by Alex De Sherbinin, David Runnalls described the relationship between poverty and sustainable development, making a distinction between the latter and the link between poverty and the environment. Despite progress in poverty alleviation in parts of East Asia and other areas, challenges to further progress remain, such as the threat of war and terrorism.

Runnalls provided the audience with some historical context for the poverty alleviation debate, pointing out the evolution of attitudes and perceptions of poverty and environment. As a result, the definition of poverty has become more multidimensional

and now includes determinants such as health and human dignity. Human development is about creating choices, Runnalls observed, alluding to Sen's model and introducing a conceptual framework that respects ecosystem services and determinants of well-being. Runnalls emphasized the link to institutional frameworks and described challenges facing current frameworks. "We must move away from the one-size-fits-all models," he said, emphasizing that multidimensional solutions are required. Different nations use ecosystem services in different ways. Strategies need to respect these differences and be based on stakeholder input. Runnalls also noted the importance of public-private partnerships.

"A mix of traditional and new technologies is required to fit into different social, cultural, political, and ecological contexts," said Runnalls. Any discussion of IISD's poverty reduction strategy must acknowledge the concept behind and the stages of a participatory freedom model to be tried in five African countries. In conclusion, Runnalls observed that any sustainable development strategy needs poverty reduction as a component: "There is no choice," he said. "Both are necessary for success and survival."

**Dr. Patricia Romero Lankao, Metropolitan Autonomous University, Campus Xochmilco, Mexico**

The link between poverty and the environment is context specific, said Patricia Romero Lankao. Poverty is subject to different conditions and its context has different implications for the environment. For example, the emigration of Mexico's poor to Mexican cities and to the United States as part of their livelihood strategy attests to this idea. Migration results in regeneration of landscapes but simultaneously in a loss in genetic diversity as agricultural livelihoods are abandoned. Thus, she cautioned against the generalization that poverty causes environmental degradation. Lankao also noted that history and globalization matter in the consideration of poverty. Why? Southern poverty has been fostered by colonialization; Northern wealth came, in part, from Southern natural resources. Furthermore, Northerners could always immigrate to the South, but his option is closed to most Southerners. The South has no possibility of competing or of investing in itself given that the North focuses on value-added activities while the South is concerned with raw resources.

Structural problems underlie the South's inability to increase the wealth and welfare of its people. At the same time there is bad governance, rampant corruption, and the tendency of Mexico's rich to look north rather than integrate a development framework. Further to this, Lankao told the audience that it was also the production and consumption habits of the North (as well as those of the minority and elites of the South) that contribute to environmental deterioration. Drivers of livelihood strategies of the poor must also be considered. "Why do they live in areas that are vulnerable to natural disasters?" she asked. These drivers operate at national, global, and regional scales and include the market demand for natural resources and extractive industries such as mining.

Lankao also pointed to urban poverty as an important issue that has implications for the land tenure system. How does this relate to poverty? What are the power relationships in

communities? Lankao pointed to the issue of structural and neoliberal reforms that have been promoted by the world's financial institutions, citing the example of the IMF/WB electricity negotiations in Mexico.

While globalization has shaped the pattern of development, it has not all been negative, Lankao said, adding, "Globalization has opened some windows of opportunity." Institutions have been created that address human dimensions, and alternative markets have been developed. "We must strengthen these but never forget the main issues and drivers of poverty and the pattern of consumption of the North," she said.

## Questions and Comments

A delegate noted that people must be engaged from the beginning in order to have a desirable outcome. Runnalls agreed that a primary purpose of the framework is to engage people and further clarified that Sen's approach suggests the freedom to participate in activities that affect one's life.

In reference to current political conflicts and instability—factors that models do not take into account—a participant asked how scientists might deal with this barrier to poverty reduction and environmental improvement. "Would this alienate us from policy makers and funders?" he asked. Runnalls acknowledged that one could run that risk by making comments about specific conflicts. Scientists cannot "duck" the issue, but involvement will always be a personal decision. He added that conflicts take a heavy toll on the population first and consequently contribute to environmental degradation.

Another participant remarked that while Runnalls' framework was "a big step from the mainstream model to Sen's model, the step could be bigger." He suggested that a more Leopoldian view should be taken and models should consider the "community of life." Runnalls agreed that the model is very human centric and another "jump ahead was necessary." However, he added that there is significant resistance to making models more sensitive to the poor in some sectors due to trade-offs between the environment and poverty reduction.

Lankao said that scientists tend to impose their vision on the communities they are working with. It is critical to understand the communities' perception, in their language, of their natural resources.

"Could energy be considered a basic human need?" asked another delegate, who also wondered if the voices in the World Bank report "Voices of the Poor" were really representative. He suggested that a more accurate interpretation of the poor would be derived from visits that lasted longer than one- to two-day sojourns. In agreement with these comments, Runnalls added that eliciting views of repressed people is very complex, yet critical. He observed that decision makers are often well meaning but simply lack contact with the affected.

One delegate questioned the priority of climate change and suggested that perhaps other areas such as energy use or the extractive industries (which have the largest number of connections) should be priorities. Runnalls agreed, noting that climate change has been prioritized by many states given the perceived threat to them. He proposed the need for development policies that address climate change issues and poverty reduction strategies.

A participant did not agree with the stated relationship between economic growth and poverty alleviation. Rather, he said that economic rewards such as education and land tenure should be relayed to the people. These are at the heart of poverty and thus must be addressed. Lankao agreed but added that the nature of the growth was fair and sustainable. Runnalls expressed no doubt that economic growth was needed for poverty alleviation. He did suggest, however, that the Washington Consensus is less suitable than Japan's model of economic growth and development.

## **Plenary Session: Patterns of Development and Sustainability**

**Moderator: Mr. Jasper Grosskurth, International Centre for Integrative Studies, Netherlands**

**Dr. Mohan Munasinghe, Executive Director, Munasinghe Institute for Development, Sri Lanka**

Mohan Munasinghe noted key links between sustainability, resource use, and poverty, observing successful examples in history as well as less favourable outcomes. While the international community has adopted measures to address the many poverty challenges worldwide, there has been no change, but rather regression and “a stabilization of expectations of international organizations.” After considering patterns of poverty, the effect of conflicts, and food vulnerability to climate events, Munasinghe noted that a multidisciplinary approach—one that reflects the myriad factors in sustainable development and poverty—was needed. “Rather than looking for the ideal definition of sustainable development, unsustainable actions should be identified and rectified,” he said. The framework of “sustainomics,” which can work toward this goal, is represented by a triangle with social, economic, and environmental vertices with many linkages and interrelationships. The three-dimensional aspect of sustainomics contributes to an understanding of poverty issues where traditional poverty definitions have not been adequate.

Munasinghe outlined some tools for analysis and durability, commenting, “Both are important elements and should be used in a complementary way.” After identifying and addressing interrelationships, environmental assessment and multi-criteria analysis are employed. Munasinghe referred to the expanded national income accounts for sustainable development, pointing to input-output tables with environmental and social interactions. These, he noted, provide insight into both income and environmental impact.

Munasinghe reflected on the former viewpoint that separated climate change from development; now, climate change is integral to the sustainable development structure.

Using the sustainomics framework, he pointed out various linkages and feedbacks. For instance, temperature stresses affect human systems, which in turn impact the socioeconomic system. Challenges include the need to focus on environmental interventions that benefit the poor, to change the nature of growth, to increase stakeholder participation, and to ensure equitable land distribution. Geographic variation must also be recognized in designing approaches to poverty alleviation. Solutions for Africa won't work for Asia. At the social and economic policy level, Munasinghe observed how important it is to devolve power and strengthen support services. In concluding, he stated that from the development perspective "Development comes first. Poverty and the environment are integral parts of it."

**Dr. Barry Smit, Canada Research Chair in Global Environmental Change,  
Department of Geography, University of Guelph, Canada**

After entertaining the audience with a sustainable development version of "Let it Be," Barry Smit observed that Munasinghe had captured many of the issues, themes, and aspects of sustainable development and acknowledged present and future needs in the sustainomics framework. How does poverty alleviation fit into the picture and how can it be applied? Smit noted that the practical approach of sustainomics could be used to assess projects or policies. At the same time, he suggested that sustainomics relied heavily on economic indicators and that the often-difficult conversion of environmental and social indicators into economic ones "may not be sensible." He illustrated this by citing the example of monetary figures assigned to village burial grounds in Samoa. The IPCC has done the same thing and even derived a value for human life. Was this necessary?

While he conceded that the objective is to design a framework that defines, analyzes, and implements sustainable development, Smit argued that these are different exercises. Defining specific or desirable goals is neither an analysis nor an implementation framework. To analyze is to understand, measure, and estimate impacts while implementation means actually doing something. He illustrated his discussion with an example of deforestation and poverty, noting that although there was continued livelihood, there was no sustainable development. A spaghetti diagram of various factors involved in deforestation could serve as a tool for analysis. Smit commented that such methods help considerably in conceptualizing sustainable development but fall short in terms of practical strategies and frameworks at the regional and local levels. He finished his talk by posing two questions for Munasinghe. First, he asked how communities are engaged in the process of sustainomics, remarking that the framework tends to be top-down and not participatory. Secondly, he wondered how sustainomics could be used to change underlying institutional structures and inequities that affect the nature of poverty.

Concurring that different models for definition, analysis, and implementation are needed, Munasinghe noted that the idea behind the framework is consistency. "It is of little use to have one framework in analysis and another in implementation," he said. Responding to Smit's second question, Munasinghe said that while decision makers may have good intentions, they have short-term vision. What can be done to change this? Implementation is key and "at the heart of implementation is empowerment and participation." Yet, this



is much more difficult to achieve than writing reports in the office, and points to the importance of the social dimension. Munasinghe also commented on the negative impact that the top-down structural adjustment program has had on the poor. International institutions oppose examining the link between macroeconomic policies and the environment.

## Questions and Comments

In the question period that followed, a delegate pointed out an apparent discrepancy between Munasinghe's matrix that indicated a low consensus on how scientific knowledge should contribute to poverty, and the following discussion about what research should be done. He added, "We have failed in useable knowledge." There are huge opportunities given the consensus on environmental goals. Munasinghe replied that the matrix was intended to illustrate what was already known—a consensus on values but a lack of knowledge. Agreeing that implementation is important, another participant noted that theory was missing in sustainable development.

In response, Smit asked, "Why do we have to have a theory for it before we can take action?" He gave the example of the Free Trade Agreement, which is in place despite the lack of supporting theory. One delegate observed the fundamental dilemma researchers face in terms of objective and subjective measures as they are alternately on the outside or inside of communities. Smit said that he did not agree that science was subservient to social processes in any way, reflecting that the idea of experts is archaic. Communities are now part of research teams.

Ultimately, sustainable means stable steady-state economic production that does not deplete resources more quickly than they are replenished, asserted a delegate. This is the current challenge—the notion of endless growth is problematic and must be addressed. The inevitable limits on economic growth and the finite biosphere must be acknowledged. In response, Munasinghe said that the issue of scale is extremely important and is in conflict with poverty alleviation. With a cap on total resource use and an increase in consumption by those who are currently low consumers, a drop in consumption is likely for the over consumers. Munasinghe further noted that the answer is certainly not perpetual growth but rather an incremental restructuring of the pattern of development.

Another delegate observed that the question was not of relevant or bad science, but rather of incomplete science. He suggested that "the missing link" was an excess of political will to keep things as they are and added that, perhaps, the political dimension was even more important than local communities. The next participant indicated that researchers often focus on win-win situations but they should not shy away from trade-offs. In answer to the first point, Munasinghe noted that the political question was key, acknowledging the need for science to be relevant to the grassroots but also to decision makers. Smit addressed the latter comment, remarking that trade-offs are key elements in analyses of sustainable development and in implementation efforts.

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## **Plenary Session: Governance of Natural Resource Issues**

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**Moderator: Dr. Peter Brown, McGill School of the Environment, Canada**

**Dr. Leena Srivasta, Executive Director, The Energy and Resources Institute, India**

### **Firewood and governance**

Leena Srivasta related India's experiences in natural resource governance as related to forestry and biodiversity, noting that key governance issues include control and access to resources, rights of stakeholders, implications on livelihoods, and conflicts and power struggles. She outlined three important elements of governance: efficient structures, access to resources, and a legal framework. In the forestry sector, there is a wide gap between the demand and supply for firewood. To date this issue has been addressed through sustainable management and plantations.

Srivasta detailed a case study in Haryana, Northern India where a Joint Forest Management (JFM) committee was established in response to cooperation between the HFD (Haryana forest department) and the HRMS (hill resource management societies). Haryana communities lived below subsistence—the land had low agricultural capability. There was free goat grazing and illegal withdrawal of firewood. Initial program incentives gave way to more sustainable livelihoods and landscapes. Villagers benefited from increased yields and water structures, income generation through non-timber forest products, and improved village infrastructure. Given this success, the program was replicated across India. The project provided valuable lesson about gender involvement, Srivasta said, noting that women carry the burden of seeking firewood and thus, are most vulnerable to ecosystem change. Remaining challenges include increasing female membership in the JFM, securing financial sustainability, building institutional strength to deal with conflicts, and involving the corporate sector.

### **Water availability and quality**

Srivasta also explained India's water availability problem, noting that there have been significant drops in the last 50 years. The problem is multidimensional, affecting women, implicating municipal incapacity to supply drinking water, and impacting the agricultural consumption of water. The approach to redress the situation is two pronged, involving an integrated watershed management approach adopted by the Government of India, and a community designed approach. Srivasta pointed out that water availability involves not only questions of governance but also of efficient water use, water pricing, and farmer education in irrigation practices. A participatory water management program evolved with 13 state Water User Associations (WUA), each with its own water use policies. Although this is a positive development, some issues remain. "Government views WUAs as an end and is happy to unload all responsibilities for reform, even though water management should be shared between the two bodies," she said. Furthermore, the scale of the program is at the village level, but needs to be expanded to the watershed level. Srivasta also questioned the power relationships and societal classes represented within WUAs, suggesting a need for research on the internal structure of these organizations.

Finally, there is the issue of water markets and the thriving groundwater market in India.

Water is also an urban issue with poor supply and quality. In this case, India is entertaining the privatization of water supply given that the state is financially limited. Srivasta cautioned that this could infringe on property rights. Furthermore, water has a strong universal service obligation. Health and sanitation aspects are critical and a strong regulatory presence is necessary. “We are on a learning curve with privatization,” she observed. Intersectoral coordination is important when ministries are project driven rather than work at a strategic level.

### **Air pollution in New Delhi**

Using the example of well-intentioned (but uninformed and therefore inappropriate) judicial intervention in the case of air quality in New Delhi, Srivasta pointed out issues of poor ministry coordination and judiciary overstepping. As the number of buses dropped during the period of conversion to natural gas, air pollution actually increased with more polluting vehicles taking the place of buses. She also noted that natural gas is scarce and thus, leaves the system highly vulnerable. An approach emphasizing ambient air quality studies and responses of the transportation section would have been preferable.

In summary, Srivasta commented that available technologies are often neither affordable nor adapted to the local context. Furthermore, India’s research and development capacity is limited; resources are spent on spreading benefits rather than on delivery. Finding a way to commercialize more technologies could help to reduce the negative impact on natural resources. Srivasta pointed to one such commercial success in the sustainable housing area—RETREAT—which is based on passive solar design, and gas and fire technology. Among numerous unresolved issues are the underexploitation of renewable energy, gaps in environmental monitoring, and a-priori impact assessments.

### **Dr. Leslie King, Dean of Environment, University of Manitoba**

In her commentary, Leslie King addressed institutional dimensions and their impact on the work outlined by Srivasta. She commented on the need to govern for access and sustainability, and for transparency and accountability. How is good governance obtained and how will it affect global and local systems? Furthermore, how is a research agenda designed around the good governance of natural resources? Noting that her institute addresses some of these issues, King outlined the research areas of the institute: causality, performance, and design. The latter clearly has implications for designing institutions that respond to environmental change.

All three of IDGEC’s analytical themes—fit, interplay, and scale—are at work in Srivasta’s projects. King noted that Srivasta’s experiences were echoed in her own work in Southeast Asia and the circumpolar North. Currently, the institute is developing three flagship projects including one on carbon management activities; each one is linked to numerous crosscutting themes.

King compared the work of TERI and IDGEC in the area of natural resource governance,

noting many similarities and shared issues. For example, the extent to which local institutions and communities are constrained by activities of international or national institutions is key for both organizations. Despite many problems and challenges, King noted that a consistent language and network have been created. She then pointed to questions that will define IDGEC's future research direction including vulnerability of communities, the way institutions assist in adaptation, and a continued look at institutional dynamics and their impact on power relationships and gender equity.

## Questions and Comments

A delegate pointed out the high variation in fuelwood supply and demand estimates and cautioned against interpreting these estimates. He asked about constraining factors for decision makers in terms of the water issue—could this have been a problem of scale, given that the ecosystem scale is fundamentally different than the one at the decision making level? How is the research community going to bridge this gap? Another delegate wondered if India's interest in privatization was an attempt to sidestep liability. He then noted that a long-term view of institutional changes, such as privatization, is required and wondered what alternatives exist with respect to liability. Another participant asked if advertising could play a role in the reduction of water consumption.

Srivasta agreed that there were many estimates for fuelwood supply and demand, all with errors. However, her intent was to highlight the gap between the two. Both horizontal and vertical constraints pose major problems. Ecosystem services are not recognized; there is a lack of ownership of these larger issues at the policy making level. Furthermore, there is very little accountability at the state level. Having said this, the state does recognize its budgetary and efficiency constraints and thus, would like to distance itself from the provision of services via privatization. The electricity sector provides an example of this. Srivasta reiterated that there should be a continued relationship between government and the private sector in a system of shared goals. She then agreed that advertising could play a major role, but said that water was not a good example. Instead, she pointed to electricity, where advertising has played a major role in promoting awareness about energy efficiency.

King acknowledged the policy and ecosystem scale gap, suggesting that research might address how institutions process knowledge claims differently. She also observed that institutional power relationships might be constraining factors.

A delegate asked how to implement policies in the face of constraints at different institutional levels. Another participant asked if there were institutions where efficiency is linked at national and local research and development scales, and if so, what the characteristics of the institution would be. Public ownership and privatization of ecosystem services are not black and white issues—although the state does not necessarily have to be involved in provision, it should provide a regulatory function.

King responded that the question of fit was important and that in the long term,

institutions need to be designed and redesigned in order to fit and to have inherent capacity to learn. She said that international institutions have negative effects on local systems and more positive interplay is needed. Srivasta also agreed that links between the national and local levels are necessary as is a bridge between research and policy.

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## **Panel Presentation: Multilevel Environmental Governance**

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**Chair: Ian Rowlands, Faculty of Environmental Studies, University of Waterloo, Canada**

### **Ian Rowlands**

Rowlands spoke to the debate over harmonization and subsidiarity of renewable electricity in the European Union. Three policy models promoting renewables are used—the feed-in tariff model, the tendering system, and tradable certificates—with no one model applicable to all countries. One advantage of harmonization is the development of a European-wide economy in renewable energy and a system that is less susceptible to protectionist pressures. Subsidiarity, on the other hand, offers flexibility with the emission bar at different levels in different locations. Rowlands said that the EU currently employs components of both systems while exploring broader national frameworks.

### **Jouni Paavola, Centre for Social and Economic Research on the Global Environment, University of East Anglia, United Kingdom**

Paavola is developing a framework that analyzes justice issues involved in adaptation to climate change. The framework stipulates proactive measures at the international level, which are then translated into national adaptation. Failures in reactive responses and the lack of burden sharing arrangements are evident. The main justice dilemmas in adaptation include financial assistance to and its distribution within the South. In Tanzanian adaptation projects, Paavola found that, in the absence of intervention, resources would be directed to the most lucrative activities—an undesirable outcome leading to further inequality. He recommended that the maximum rule of the most vulnerable first be adopted as the primary guideline.

### **Michele Betsill, Department of Political Science, Colorado State University, U.S. and Harriet Bulkeley, Department of Geography, University of Durham, England**

Betsill discussed the Cities and Climate Protection (CCP) program, which advocates a multilevel perspective on climate change. The CCP program emphasizes three network aspects: transnational, national and regional coordination, and local authorities that can act independently. The concept of transnational networks does not fit easily into existing frameworks, as it breaks down traditional international and national divides. Bulkeley discussed two types of multilevel governance. The nested Type I has tiers of government that share competencies and focus on government, not governance. The polycentric Type II has overlapping spheres of authority and is more horizontal in its approach. “Multilevel governance and CCP are a very fertile way of thinking,” she said.

**Lynn Wagner, Earth Negotiations Bulletin/International Institute for Sustainable Development (IISD), United States, and Elisabeth Corell, Swedish Institute of International Affairs, Sweden**

Corell noted that bottom-up approaches respect local knowledge. Wagner pointed to the importance of middle level groups for the development process via fostering personal development and capacity building, and providing education and information essential for local analysis and adoption. She said that few international bodies refer to middle level groups, local participation, or education. The team then analyzed the current framework of international bodies. Differences in international organizations and their inclusion of middle level groups are likely a result of different timeframes, languages, and scales as well as different levels of political contestation of the issues.

**Hermann Ott, Climate Policy Division, Wuppertal Institute for Climate, Environment and Energy, Germany**

Ott indicated there is currently no coherent approach to environmental regulation. He then relayed various hegemony scenarios. He noted that considerable problems exist when the hegemony sets an agenda and only a few countries follow, while the worst scenario occurs when the hegemony does not lead and does not like to act as in the case of Kyoto and ICC. Ott asked, “Is it possible to build regimes without a hegemon but against a hegemon?” This, he suggested, is a role for multilevel environmental governance since it can influence and interfere at many levels (i.e. state to state) and that, in fact, a hegemon world order can be beneficial to the development of multilevel environmental governance.

**Questions and Comments**

In the question period, a delegate asked about the impact of environmental policy harmonization on new EU countries. Rowlands responded that although similar emission targets would be set, implementation would be different and gains in energy efficiency could also be used. Another participant noted that change in governments over time could affect the dynamics of multilevel governance. One delegate asked if there were examples besides the International Joint Commission that have survived despite national differences in politics and changing governments.

Bulkeley noted that multilevel governance was about changing the nature of the state and people’s behaviour. Betsill concurred, noting that the CCP was built up from local to national levels and thus, is more buffered from constraints at the higher levels. Ott predicted that globalization would impose constraints on hegemony and diversification of the world order will continue while the state will endure.

How does one deal with the different priorities that a partnership between states and NGOs brings to the table? Ott pointed to many examples where civil society has taken the lead (i.e. the Red Cross) and suggested the International Union for the Conservation of Nature as an example to follow.

A final question addressed the strengthening of international law. Ott responded that it is

in the interest of the non-hegemons to strengthen international law and to see its observance. Paavola added that international law would create pressure for cooperation and reduce non-compliance. In conclusion, Bitsell suggested increasing the capacity of those who agree with international law.

## **Plenary Session: Governance of Pollution Issues**

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**Moderator: Mr. Marc Levy, Center for International Earth Science Information Network (CIESIN), Columbia University, United States**

**Dr. Robert Guimaraes, Director, Sustainable Development Division, United Nations Economic Commission for Latin America and the Caribbean (ECLAC), Chile**

Global perceptions on sustainable development and the challenges related to governance have evolved over the past decade, with progress seen in the emergence of environmental regimes, regulations, agreements, negotiations, and citizen participation, said Robert Guimaraes. While critical issues remain related to policy formation, he asserted that the unique and indispensable role of the state in environmental policies must be recognized. States are unique in their ability to deal with equity and social justice issues, and indispensable to tackling modern problems related to the exhaustion of resources.

The Rio Summit in 1992 laid the foundations for multilateral environmental agreements on sustainable development. Many countries established environment ministries and more than 7,000 communities are involved in the UN Local Agenda 21 plan of action. However, conditions to development aid, such as the proposal of substituting aid for trade, also emerged and most of the principles of sustainable development are still considered by developing countries as a restriction to growth. Guimaraes indicted corporate globalization and competition for retarding the capacity and willingness of nation-states to impose unilateral measures of good environmental management. The pressures of policy convergence mean that measures will only be taken if they are in step with primary competitors, with the net results that markets become the primary drivers of changes in environmental performance.

The main threat to governance comes from trade regimes, specifically, the section of GATT which states that “Each member shall ensure the conformity of its laws, regulations and administrative procedures with its obligations as provided in the agreements to trade in goods, services and TRIPS.” But in Guimaraes’s view, trade regimes are dominated by business interests that fail to comply with environmental regulations, and moreover, operate under a veil of secrecy weighted in favour of maintaining the status quo.

Free trade, he said, is a hypocrisy because it is applied only to developed countries, and is much less protectionist in the developing world. “The dirty secret” of capitalism is that it is rooted in expanding total production to sustain endless accumulation of capital, but fails to internalize the high costs of natural resource depletion and environmental

pollution, which would certainly serve as the *coup de grâce* to the viability of the capitalist world-economy, Guimaraes said.

Guimaraes warned that policy decisions on environmental governance, and who pays for the environmental costs—state or society—are urgently needed. He suggested six human dimensions avenues that need more research:

- It is imperative to study the proposals put forth by 1978 Nobel laureate James Tobin, which show that a tax of only 1% on daily currency transactions could yield as much as \$400 billion yearly for environmental governance—or 40 times the entire budget of the UN in all of its specialized agencies.
- Governance should be explored along private or voluntary schemes, such as the ISO 14000 series of 1996, the Global Reporting Initiative launched in 1999 by UNEP, and the UN Global Impact unveiled in 2000. There are a plethora of private environmental regimes that need more research.
- The concept of global governance was once viewed as primarily concerned with inter-governmental relations, but must now be recognized to involve NGOs, citizens' movements, transnational corporations, academia, and the mass media.
- Partnerships are still only a promise, not yet a reality. The positive and negative consequences of environmental governance, accountability and equity need to be examined.
- The proposals vis-à-vis establishing a world environmental court should be studied.
- The gap between research findings in human dimensions and how they are communicated to other stakeholders, parliamentarians, etc. needs to be bridged.

The future of environmental regimes on sustainable development is intimately associated with the future of politics, he asserted. Politics must converge with public interest, and markets should educate and civilize the planet, rather than give rise to pure competition, he said.

**Dr. Eduardo Viola, Professor of Political Science, University of Brasilia, Brazil**

In his commentary, Eduardo Viola said that Guimaraes, and perhaps the human dimensions research community in general, has underrated the importance of the Earth Summit and the transformation it has brought forth in the decade since. Cooperation in the global arena has been much more difficult than was supposed at the end of the Cold War, with much greater conflict in the world than anticipated. Viola asserted, “The last 15 years have shown us it is very difficult to build up market systems in the world. However, the procession of failed economics, failed states, and failed societies has not been a consequence of globalization, but of those societies that are already integrated in the global economy that have not had the globally responsible attitude to help the other



societies. It has been their failure to build up global markets and economies.”

Another major change since the Rio Summit has been the impact of the acceleration of the information technology revolution. Since the mid-1990s, there has been growing confidence in the capacity of technology to solve the problems that technology created, even as the technological gap among societies increased dramatically. But protective features that reflect deep systemic issues place a lot of limitations on sustainable development, Viola said.

Viola challenged the extent to which public participation would actually be a driving force for improving the governance of pollution. With its positives, increased participation also comes with negatives, such as poor organization and inflation of expectations that create stakeholder participation fatigue and cynicism. “More important than public participation is institutional quality to ensure effective governance,” he said.

In Viola’s view, governance of pollution issues has three dimensions: basic sanitation (national, subnational), industrial pollution (national, regional, transboundary), and carbon emissions (global). This approach reveals the very complex and highly heterogeneous nature of governance of pollution, where there are major advances in some places, but not in others. Carbon emissions, for example, have been increasing dramatically in most countries since the Rio Summit. Governance is largely dependent on institutional resolve to promote cleaner, more productive processes. Major progress is taking place in middle-income countries. Regional institutions have effectively promoted cooperation at the regional level among developed countries and emerging countries; the EU is a prime example of multi-layered environmental governance.

In conclusion, Viola noted that while environmentalism has become a successful mainstream movement in developed countries and some emerging countries, the ideas of “radical environmentalism”—the ones that question material prosperity, free market economics, and support the preservation of most of the remaining global biodiversity—have faded.

## **Questions and Comments**

Guimaraes stated that the mushrooming of states and NGOs since the 1960s has made global governance much more difficult, but cautioned that corporations do not represent democratic politics, since there is no public accountability.

A participant remarked that the 1990s were a very special time for environmental and sustainable development issues. The end of the Cold War opened up opportunities to discuss other issues on the global agenda, and there was emphasis on making the market system work for the environment. But with September 11, terrorism is the dominant issue in the global environment, which may actually start to push environment off the agenda, he said.

There has been a lot of experimentation with new public-private partnerships of public, global conventions and local initiatives, chair Marc Levy noted. Are there any conclusions about which one of these governance approaches are more effective under which conditions? Where should effort be focused?

Good governance is clearly linked to scale, Guimaraes said. “The more local [the scale], the more we have been able to effectively improve governance in environmental policies. And the more global we go, the more uncertainty we have on governance.” At the same time, he noted that in Rio, the slogan was “Think global, act local.” The sense at Johannesburg though, was that “to think globally, more important than acting locally is to articulate regionally.” There are still more questions than answers, he said.

A participant asked for elaboration on a governance based the International Court of Justice model, rather than the World Environmental Organization. There is currently a lack of implementation and enforcement of environmental regulations, Guimaraes explained. An international court on environmental governance could address the traffic jam of multilateral environmental agreements. Institutionally, such a court would be more effective than a new bureaucracy.

Viola concurred that since September 11, the U.S. and the western world has been facing a state of asymmetric war, that will probably be protracted, long term, and undermine public awareness of environmental issues and cooperation on climate change.

## **Panel Presentation: Early Warning and Preparedness**

**Chair: Neil Leary, Assessments of Impacts and Adaptations to Climate Change in Multiple Regions and Sectors (AIACC) Project, START, United States**

*Human Dimensions of Climate Change Activities in Jamaica & the Caribbean*

**Anthony Chen, Department of Physics, University of the West Indies, Mona, Jamaica**

Anthony Chen described efforts in the Caribbean to predict and respond to short-term seasonal climate change. The Project on the Threat of Dengue Fever aims to determine the extent of the association between climate and the incidence of dengue across the Caribbean; to identify vulnerable areas and communities and associated factors; to determine future impacts and adaptation; and to make the knowledge gained accessible and useful to decision makers.

Insufficient resources are the main barrier to adequate education and response regarding the threat of dengue. There is no long-term planning to address the possibility of increased transmission, and there are no easy answers to mitigate and adapt in such hostile environments, Chen said. A cost-benefit analysis is needed to demonstrate the value of the process.

*The Stages of Natural Hazard Mitigation and Preparation*

**Nancy Beller-Simms, Human Dimensions of Global Change Program, US  
National Oceanic and Atmospheric Administration (NOAA), United States**

Economic, cultural, and regional differences lead to different approaches to hazard mitigation and preparation, said Nancy Beller-Simms. She described her investigation of four counties in California, Arizona, New Mexico, and Texas as they prepared for, experienced, and repaired from the impacts of the 1997–1998 El Niño.

There were major differences in how jurisdictions reacted to El Niño predictions. For example, California launched a public information campaign, while Arizona focused on emergency military manoeuvres. California set up a statewide task force, with sizeable emergency management planning in place. In Texas, by contrast, an individual who was also the court clerk oversaw emergency management.

In conclusion, Beller-Simms pointed out that mitigation and preparation activity for a specific natural disaster also brings the benefit of having a framework in place to address other hazards down the line.

*Water, institutions and knowledge: a comparative analysis of decision making in  
Arizona, United States and Ceará, Brazil*

**Maria Carmen Lemos, School of Natural Resources and Environment,  
University of Michigan, United States**

Institutional environments shape the willingness and ability of decision makers to use climate information in water management, said Maria Carmen Lemos. Focusing on decision making in Arizona and Brazil, she reported that the more complex the institutional system, the harder it is to adopt innovations in its laws and norms.

Water managers in Arizona and Brazil face similar challenges, such as the reconciliation of multiple and sometimes contradictory uses; a wide variety of stakeholders; management systems that span different scales and overlapping jurisdictions; and resources subject to scarcity and depletion. However, Lemos reported that water managers in the U.S. face great institutional inflexibility, because of physical complexities and built systems that do not adapt easily to changes.

In contrast, Brazil has initiated water reform in recent years based on decentralization, participation, integration, and environmental sustainability. Institutional reform at federal, state and municipal levels have led to river and watershed innovations. It is important that systems going through institutional change set themselves up to be more flexible in the long run, Lemos concluded.

*Climate Change Information: Reaching Decision Makers and the Public*  
**Christopher Lenhardt, CIESIN, Columbia University, United States**

The immediate challenge is to get climate change on the radar screen of policy makers, said Christopher Lenhardt. Scientists need to get involved and communicate problems to policy makers, and at the same time provide the appropriate kinds of scientific information or products to fill their needs. With different characteristics from one place to another, he emphasized that one size does not fit all.

Change will come through indirect paths, he said—through technical experts and advisors to policy makers, and through agenda setters such as public policy champions, civic leaders, NGOs, and the media. It is critical to ensure that resources are available for educational initiatives among the general public and to incorporate earth sciences into the school curriculum. The private sector may also have an important role to play.

*Sustainable Development Indicators for Global Change in the Philippines*  
**Maricel Tapia, Environmental Forestry Programme, College of Forestry and Natural Resources, University of the Philippines Los Baños, Philippines**

Sustainable development and environmental changes have different meanings in the context of local culture-environment systems, Maricel Tapia said. In the Pantabangan watershed in the Philippines, where land has been denuded, climate change is perceived by the indigenous people in terms of the impacts on the beauty of the environment, the relationship of trees to water level and vice versa, farming activities, and water availability. Tapia observed that people are very much a product of their surroundings, hence are valuable sources of information on local environmental sustainability. “They are the victims of the consequences of global environmental changes, so it is critical to include their perspectives in the science,” she said, concluding that culturally relevant indicators provide a more responsive framework that caters to the needs of local people.

## **Plenary Session: Climate Change and Agriculture**

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**Moderator: Dr. Aston Chipanshi, Agriculture and Agri-Food Canada**

**Dr. Vaclav Smil, Distinguished Professor of Geography, University of Manitoba, Canada**

Vaclav Smil described the unknowns of climate change and agriculture. In a simple system a rise in greenhouse gases equates to a rise in temperature but such predictions are not as simple in a complex system. In fact, there has been an uncoupling of the relationship between CO<sub>2</sub> and temperature throughout geological history. While CO<sub>2</sub> may be a driver of climate change, the evidence is not conclusive, he observed. Plants have grown in high CO<sub>2</sub> atmospheres before and different plants respond differently to CO<sub>2</sub> concentration. For example, C<sub>3</sub> plants respond more strongly to increases in CO<sub>2</sub> compared to those with other metabolic pathways. Twenty to thirty per cent greater yields

would be expected if CO<sub>2</sub> levels doubled. However, given that other factors such as water and nutrients are not constants, this will not happen.

Smil observed that increased CO<sub>2</sub> levels correspond to increased water use efficiency. Given the different temperature and precipitation variables in relation to CO<sub>2</sub> concentrations, the possible scenarios that could result are endless. Slight increases in temperatures will not be catastrophic for conventionally grown crops—these changes are expected. “Problems arise when you factor in the distribution of precipitation,” he said, citing the example of China where climate change could intensify the poor distribution of precipitation. On the other hand, climate change may result in more equally distributed rainfall. In essence, models are good for the big picture but are less reliable for finer small-scale scenarios. Smil left the audience with the question of how GMOs might impact this already uncertain picture. Noting the tremendous potential of GMOs, he concluded that despite its critics, the technology is unstoppable and its direction unimaginable.

**Dr. Cynthia Rosenzweig, Research Scientist, NASA’s Goddard Institute of Space Studies, United States**

Acknowledging Smil as a wise advisor in his “neither dire nor optimistic view” about climate change impacts, Cynthia Rosenzweig recognized his insights into efficient use of land, water, and fertilizer as key mitigation strategies. She also concurred that the agro-ecosystem approach should be expanded to the demand side—a holistic view that is necessary to move forward. In contrast to Smil, however, Rosenzweig pointed to the importance of recognizing what is known. For example, despite all the complexities of the systems involved, it is now possible to predict a divergence of vulnerabilities between developing and developed countries. High temperatures were expected to have negative impacts in developed countries, but instead yields will be at much greater risk in lower latitudes, a prediction affirmed by many studies of rural communities and agricultural systems. This, Rosenzweig noted, was the first great contribution of social science to the field of climate change. The second is the notion that adaptation is integral to climate change research. The corollary, however, is that adaptation is not always possible, complete, or simple, as witnessed by the inability of current cultivars to reverse the effects of climate change. The social science perspective brings tremendous insight about the drivers of human adaptations.

On the biophysical side, climate-induced changes are going to be heterogeneous, positive or negative, and will be changing through time. However, these impacts are of uncertain magnitudes and distribution. “What do we do with this knowledge?” she asked. While climate change models cannot determine what will happen in one region, they can relate changes in seasonability and intensification of hydrological regimes, for example. Furthermore, changes in agro-ecosystems will not follow a simple path as has already been illustrated by the rapid, unpredicted expansion of pests. Rosenzweig envisioned a bridging between the two streams of climate change research. A model is needed to connect the groups—the seasonal to inter-annual, the decadal to centennial—that focuses on stakeholders, adaptation, and policy makers.

Another divide exists between scientists working on adaptation and those on mitigation. Rosenzweig said that tremendous opportunity exists for agriculture to contribute to mitigation in terms of carbon. In conclusion, she noted that the biggest challenge facing scientists is the need for integration leading to a new form of global synthesis that recognizes regional and local effect and global import. “We need new processes. How do we create a braid that is strong and that will respect differences across disciplines and will contribute to the world in the future?”

## Questions and Comments

A delegate asked how much of the world food supply is produced using GMOs, and what the danger of potential monopolies over crop strains is. Another participant queried how factors external to agriculture, such as urbanization and biodiversity, would play into the issue. He also wondered about the role of institutions and political conflicts. In a similar vein, another comment related to the fact that agriculture is not immune to political change and broader concerns of urbanization and conflicts. How does this affect future research?

Smil said that GMO corn accounts for 90% of U.S. production, noting that statistics exist for GMO production in China and Argentina as well. He observed that concentration of power and ownership is the global trend, although some countries like China and India do not allow easy entry to foreign corporations. On the point of carbon sequestration, Smil commented that even humic acids are eventually lost. “Don’t plough and use herbicides,” he said, arguing that improvements in efficiency and other measures may be more important than carbon sequestration. Perhaps even a dietary change away from meat consumption would make a greater impact.

Attention to the institutional level is clearly important, Rosenzweig said. The issue of climate change could provide a change avenue for agricultural institutions. She argued that carbon sequestration could lead the way to sustainable agriculture and provide a way for institutions to employ long-term thinking and incorporate the new agro-ecosystem paradigm. In contrast to Smil, Rosenzweig said that agriculture is a “flagship sector” and could thus take a leadership role in carbon sequestration. “We shouldn’t wait around for a silver bullet on mitigation issues,” she said. “Agriculture is and should be taking a leading role.” Urbanization will drive the need to improve efficiency. Rosenzweig also remarked on the importance of the revival of urban agriculture and its potential for improvements in the quality of life.

A participant asked how the gaps in the literature about regional and local impacts of climate change might be addressed. Should society wait for the results or mitigate now? One delegate noted that while agricultural efficiency is important, the point of sustainable livelihoods in developing countries is central to climate change discussion. Along similar lines, a participant remarked that the examples given have been from North American monocultures. He wondered about the problem of methane and rice production, adding

that perhaps a reduction in food consumption by Northern countries would not only alleviate the problem of food production but also reduce obesity and diabetes. Another audience member was concerned about the North American interest in carbon sequestration as another subsidy for agricultural production in marginal areas.

In response to the rice question, Smil said that China has decreased the area it plants with rice, and that methane emissions are a minor issue compared to the daunting prospect of emissions from an increasing number of cars. He suggested that sustainable livelihoods would only be feasible with the removal of agricultural subsidies. “We are producing more calories than needed for our western sedentary lifestyle and we spend less than 15% of income on food.” Without subsidies, farmers will make ends meet, both in developed and developing countries. Smil said that rational solutions should be implemented now, rather than waiting for further results.

Rosenzweig acknowledged the challenge of current knowledge gaps, yet noted that many mitigative actions can be taken now—mitigation will “help us proceed towards an unknowable future.” She argued for the need to improve adaptation. Disagreeing with Smil, Rosenzweig said that if subsidies help U.S. farmers move away from the negative effects of monoculture and embrace agro-ecosystems, they are worthwhile. The issue of sustainable livelihoods is extremely important yet difficult to address in the face of globalization and subsidies. Rosenzweig remarked that as agriculture is a common good, the free market should not decide its path. In answer to another question, she agreed that change on the agricultural demand (i.e. diet) could have significant effects on food production. And in disagreement with Smil, she said that rice responds strongly to high temperature; the long-term effect and methane release is a concern.

One participant noted that perhaps farmers in developed countries are actually more vulnerable due to their lack of exposure than those in developing countries, citing the example of the BSE crisis. While Rosenzweig agreed, she also noted that the capacity to respond and adapt is greater in developed countries with their access to research and financial resources.

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## **Panel Presentation: Millennium Ecosystem Assessment**

**Chair: Marc Levy, CIESIN, Columbia University, United States**

*Millennium Ecosystem Assessment: Conceptual Framework*

**Thomas Dietz, University of Michigan, United States**

Dietz introduced the conceptual framework of the MEA and its intention to provide information to international bodies and decision makers. The MEA documents changes in ecosystems and effects on human well-being and other life forms. Dietz outlined the framework components: ecological services, ecological provision, regulatory services, and cultural services, all of which are connected by supporting environmental services. The framework also attempts to identify trade-offs in ecosystems. As Dietz outlined the steps in the multi-scale MEA process from identifying drivers to evaluating response

options for policy makers, he noted, “We always have information from and feedback to stakeholders at every step.”

*Millennium Ecosystem Assessment: Responses*

**Ben S. Malayang III, University of the Philippines, Los Banos, Philippines**

Malayang outlined his work on the responses to global fuelwood and fibre insecurity. Worldwide wood consumption is increasing while the production of fuelwood continues to drop. Rather than a reduction in fellings, the response has been the dramatic expansion of forest plantations worldwide. While the impact of fellings may be reduced by substitution, forests can't be replaced. Protection for old growth and tighter forest management standards are some of the preconditions required for viable plantations. Malayang noted that policy drivers have to be coupled with improved technology while supportive institutional arrangements and stronger tenure systems are also needed.

*Millennium Ecosystem Assessment: Scenarios*

**Gary Peterson, University of Wisconsin, United States**

Gary Peterson of the MEA Scenarios Working Group presented draft scenarios that, in narrative fashion, outline potential consequences of global change for human welfare and ecosystem services. Scenarios are useful in high uncertainty/low controllability situations. There are four MEA scenarios:

- Technogarden
- Global Orchestration
- Adaptive Mosaic
- Order through Strength.

Peterson noted that trade-offs between scenarios are unavoidable. For instance, Global Orchestration could decrease economic inequality yet would have an irreversible “ecological bite-back” while Order through Strength could provide security, but would increase inequity. He reiterated the purpose of the MEA scenarios to inform decision making and to bring ecological tools to the table.

*The Challenges of Integration: Insights from integrated natural resource management research by the Alternatives to Slash-and-Burn program*

**Tom Tomich, CGIAR, Kenya**

Tom Tomich introduced the Alternative to Slash-and-Burn program (ASB) as a subglobal, smaller scale assessment. The ASB concentrates on developing new multi-scale assessment methodologies and on how to better meet stakeholders needs. Tomich explained the nesting of the spatial scales of biomes and global concerns that ASB uses. ASB is now moving from the plot level scale to the landscape and is anticipating the use of scenarios that would enable it to look further ahead. Using the example of data collected for one of ASB's study sites in Sumatra, Tomich noted that the meso-scale was



missing. The advantage of ASB is that it is a boundary organization with links to NGOs, policy makers, farmers, and although limited, the private sector.

## **Questions and Comments**

A participant asked how MEA data would be translated into synthesis reports. Another participant noted a disjunction between the MEA conceptual framework and the scenarios, observing that human dimensions appeared to be add-ons. A delegate from Brazil questioned the apparent lack of interaction between the scenarios. Another delegate thought that the issue of livelihoods was not adequately captured with such an emphasis on efficiency.

Dietz noted that the MEA does have the notion of human welfare as an integral part, yet conceded that some of the linkages that include this in the framework still need filling in. The long-term MEA goal is to build capacity and to fill the dearth of knowledge. Malayang concurred that there was a high reliance of the model on services and that while fibre and fuelwood insecurity is a reference to human well-being, a more explicit reference is required. Peterson noted that a whole array of communication tools is being utilized to convey the MA. Some scenarios are more connected than others.

Another delegate asked if an evaluation of the MEA's or subglobal's communication strategy is in place. The next participant questioned the wisdom of labelling the scenarios given potential cultural differences in interpretation and misinterpretation by policy makers. In response, Thomson said that project approval hinged in part on having evaluation goals. He also noted the importance of scenarios at the subglobal level, where feedback on the storylines can be obtained. Applying scenarios at the local level could shed light on well-being. Malayang also noted that the MEA was attempting to assess the nature of responses across different conditions and trends, which can inform global systems and policy makers. Peterson said that using evocative names enhances scenario labelling.

## **Plenary Session: Vulnerability to Climate Change**

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**Moderator: Dr. Coleen Vogel, University of Witwatersrand, South Africa**

**Dr. Karen O'Brien, Center for International Climate and Environmental Research (CICERO), Norway**

Vulnerability research can make the somewhat abstract issues of climate change more relevant to the "here and now," said Karen O'Brien. Vulnerability researchers look at the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change. However, O'Brien noted that there are two very different interpretations of vulnerability commonly found in climate change literature. The first interpretation views vulnerability as a means of defining the extent of the climate change problem—the higher the vulnerability the larger the climate change problem. The second interpretation

considers vulnerability as a basis for identifying how to respond to climate change. In both instances, adaptation to the vulnerabilities is critical.

Adaptation refers to actual adjustments or changes in ecological, social, or economic systems in responses to actual or expected climatic effects or impacts. On the other hand, adaptability, or adaptive capacity, refers to the potential for adaptation, O'Brien said. Some regions, ecosystems, or social groups may be unable to cope with potential adaptations, she explained. Species may be unable to migrate or regions and individuals may be unable to access the necessary resources or capital to adapt.

The “chicken and egg” question in climate change research is whether vulnerability shapes adaptability, or vice versa. “This has important policy implications, especially as adaptation inches its way up in international climate change policy negotiations,” she noted.

Who is vulnerable to climate change, why, and what can be done about it? A common set of indicators reflecting some universal understanding of vulnerability is necessary for reaching a global perspective on which countries will be worst and best off, O'Brien said. This might include lives lost, economic damages, and other factors that together offer a big picture—although not the complete picture since vulnerability depends on scale. The picture also changes as the definition of vulnerability is adjusted to different scales, and different cultural values are considered.

Norway, for instance, is generally considered to have low vulnerability to climate change. Warmer weather projected for the country is not considered a great threat, except to Arctic ecology. Some sectors may actually benefit from warmer temperatures and a longer growing season. Norway has a very high adaptive capacity, with rich oil and gas reserves and outstanding education, technology, and economic and social equality. However, O'Brien noted that exposure to vulnerability is uneven, with some parts of the country forecast to experience much greater changes than others. For example, rural municipalities in the middle of Norway will have a much lower adaptive and much higher sensitivity to climate change because their livelihood depends on agricultural and natural-resource-based activities.

Context is vital to the vulnerability framework. Climate change is taking place within the context of multiple stressors, including HIV/AIDS, conflict, and economic globalization. Trade liberalization is changing the context of agricultural production for many farmers in the world, O'Brien pointed out. Still, climate change is not first and foremost on most people's minds, she lamented. Even among the most vulnerable populations, it is not usually a prioritized concern. Climate change and the Kyoto Protocol has not created the same popular movements as, for example, the WTO negotiations, which is perplexing “since both climate change and globalization involve issues of equity, accountability, responsibility, livelihood and self-determination.”

O'Brien noted that climate change issues have traditionally been presented as scenarios, such as *What will the future climate be like? What are likely impacts?* and *Who is most*

*vulnerable?* However, this approach immediately makes the issue abstract and not that relevant in the minds of many: “If we want to make the climate change issue more relevant and really begin to engage people to take action, we have to make it an issue of here-and-now, not 2050 or 2100—and vulnerability research can do this,” she asserted.

The past summer was marked by significant extreme climate events around globe. France experienced anomalously higher temperatures in August, resulting in a record mortality rate estimated at 15,000 people. The most vulnerable were elderly and urban citizens. “It was a question of low adaptive capacity,” O’Brien said, “because of ill-health, limited mobility, weak social networks, and inadequate access to medical care.” Residents in urban areas had to combat the urban “heat island” effect and very high temperatures that stayed through the night. Vulnerability can also be attributed to the deterioration of the French social welfare system as a result of liberal economic policies, the privatization of health care, the loss of community networks, and so on, she said.

While some people think of climate change as inevitable, “others of us think that vulnerability is politically and socially generated,” O’Brien said. Different places bring different contexts of vulnerability. The August heat wave in India had a different effect, where the people who died were laborers who still had no choice but to go out and work in the fields.

Given the growing consensus that climate change is a problem, the community needs to work at getting the urgent message across better, she said. The challenge is how to transform the issue of climate change from a scenario-based abstract idea that most people and policy makers ignore, into a contemporary movement where issues of vulnerability, livelihoods, and equity are at the core, she concluded.

**Dr. Roger Kasperson, Executive Director, Stockholm Environment Institute, Sweden**

In his commentary, Roger Kasperson noted a number of important points that O’Brien raised in her presentation including context of multiple stressors, evolving vulnerabilities and dynamics over time, and a common conceptual framework that builds on cumulative knowledge. The challenge now is to move from theory to reality, and in such a way that theory and practice continually feed each other, he said.

While a great deal of progress has been made to address climate change, the research community needs to make a major push to communicate vital information to decision makers and practitioners. Vulnerability analysis must be broad and holistic. He also noted that some of the same driving forces that are shaping multiple sources of stress are shaping vulnerability. This is an area that warrants formal modelling for a better understanding of the different causal structures and dynamics surrounding different kinds of systems.

It is important for the research community to continuing building a knowledge base of

highly integrated local studies, while trying to understand global syndromes of climate change, he said. This knowledge needs to be integrated into a macro knowledge base.

Kasperson identified some major holes in the evolving research program on vulnerability. Attempts to analyze vulnerability are sabotaged by time and space displacements. “We’re remarkably successful in spatially exporting damage to future and distant populations—placing vulnerabilities on people in distance places, and jeopardizing the future through the activities that we do,” he remarked. Many are hidden problems and need to be made transparent. Non-linear and discontinuity of research is another gap. Moreover, the importance of values as a significant driver of both vulnerability and environmental change has been underrated. “But you can’t really identify and analyze consequences and damage without reference to values and changes in values on the global processes,” Kasperson said.

Kasperson identified five areas where the HD community can make pressing near-term contributions to international policy processes: assemble accumulated knowledge in a rigorous meta-analysis; be alert to “policy windows,” when issues of climate change can be promoted; urgently raise public awareness on global environmental change; establish priorities, criteria, indicators, indexes, and mapping methodologies; create models and prototypes of resilience-building activities in communities, regions and among the highly-vulnerable populations of the world; and develop priority systems, such as for funding adaptation and emergency systems.

## **Questions and Comments**

Referring to O’Brien’s call for a grassroots movement on climate change, a participant said that vulnerability in society is actually very connected to the way the national economy and national state functions. He suggested that the best way to bring the issue of climate change vulnerability to the mainstream social sciences and public attention is to connect the issues to economics and good governance. The community is not the basic unit by which the modern world is organized.

A participant disagreed that the community should focus on the “here and now.” In 50 years, there will be billions more people to feed on the planet, and it is vital to reduce vulnerabilities and increase buffers, he said. Societal changes will greatly impact vulnerabilities.

Another participant agreed that it is important to create good indicators of vulnerability, and test them for the ability to explain or provide some predictive value over time.

An audience member said he was particularly struck by Kasperson’s comment that the developed world exports a lot of vulnerabilities to less powerful and less wealthy parts of the globe, future generations, and the non-human world. Holistic thinking must include non-human life. “It is difficult to conceive of managing or reducing vulnerabilities for human populations as long as we continue to be callous regarding nature and non-human

forms.” Unfortunately, thinking is anthropocentric, and fails to recognize “the canaries in the coal mines which are excellent predictors of human vulnerability,” he said.

## **Closing Plenary**

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Over the past decade, many questions on environmental change have been answered by thousands of case studies by the international human dimensions research community. The big challenge now is “to go from the small-scale findings to the big picture and bottom-line answers for dealing with pressing public problems,” said Marc Levy. At the same time, a participant observed, the HD community will need to identify gaps and new issues in research.

Global climate change is an artifact of human failure and the lack of vision, said Peter Brown. The remote drivers are thinkers such as Francis Bacon, Auguste Comte, and others who contributed to the value-free model of science, but the proximate drivers are tenured professors, provosts, and research directors who have not articulated any analytic vision of a better future. This vision must be rooted in the concept of inter-species fairness, rather than the superiority of humans, and account for other institutions compatible with modern biology, Brown said. “We need a vision of a civilization of which we can be proud,” he stated.

The HD community needs to be impatient about the changes occurring in the planet and the urgency facing the most vulnerable people in the world, in the developing countries that are bearing a lot of the burden of global environmental change, said Roger Kasperson. The community must assume a vanguard and leadership role in “creating a new kind of science that is holistic and value-centred, rather than value-free, and collaborate on near-term policy interventions to show that we can really make a difference to,” he said. Humanists and philosophers are critical to building a variety of bridges with ecologists and other physical scientists, he added.

Extensive research on vulnerability has been done over the decade by researchers from developed countries leading projects in developing countries, but the results do not always get back to local communities, noted Alejandro Leon. These findings need to be communicated to policy makers in the developing countries. Researchers also need to apply their knowledge back to developing communities, in the way of groups such as Engineers Without Borders. Increased participation of scientific communities in the South is also needed.

There has been great emphasis on local studies—still, the value of global and national scale studies, especially to policy makers, must not be overlooked, said Richard Klein. In hindsight, he said the open meeting might have featured more sessions on methodological tools for HD research, and greater participation from economists. Policy makers should be invited to participate in future open meetings. It was also suggested that consultants could play a role in facilitating action on the agenda.

There is an open environment for people in the North to talk about poverty alleviation for people in the South; however, there is little discourse on the other end of the spectrum—the huge consumption by developed countries. “It would be interesting to look at how we actually think of sustainable development in the North, and how that might affect what’s happening in the South,” a participant said.

Coleen Vogel outlined the process to follow the meeting. The science, viewpoints, and challenges laid out by participants at the 2003 Open Meeting will be captured by the transition committee and passed along to the planning committee for the 2005 Open Meeting. In the meantime, engaging the wider community and making bona fide changes for the better will be the HD community’s monumental task, she concluded.