Report of the 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community

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The 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community (hereafter the 99 Open Meeting) was held on June 24, 25 and 26, 1999 at Shonan Village Center in Hayama, Kanagawa in Japan. The meeting was hosted by the Institute for Global Environmental Strategies (IGES), with co-sponsorship from the Environment Agency of Japan and the Asia-Pacific Network for Global Change Research (APN). Over 300 researchers from 41 countries participated in the meeting, of which 191 made presentations.

The 99 Open Meeting began with an Opening Ceremony, and there was a total of six sessions, one in each morning and afternoon of the three days, followed by a Closing Session on the last day. Each session consisted of two parts: a Plenary Talk and seven or eight parallel sessions. In Session 4, however, a poster session was held in place of the Plenary Talk. Please refer to the program for more detailed information. The outline of the meeting was as follows:

1. Opening Ceremony

Time/Date: 09:00-09:30 June 24, 1999
Venue: Dazai-Hall, Lofos Shonan

The chair of the Opening Ceremony was Dr. Shuzo Nishioka, a co-chair of the International Science Planning Committee (ISPC), which planned the 99 Open Meeting. In the ceremony, three speeches were given.

The first speaker was Dr. Jill Jaeger who was the other co-chair of the ISPC. She explained that the 99 Open Meeting was the third meeting following two successful meetings held at Duke University in 1995 and at IIASA in 1997, and that its object was to build a network between researchers in the human dimensions of global environmental change research community. She emphasized that some 200 presentations to be made during the meeting were selected from more than 500 submissions, and that the increase in both quality and quantity of the submissions shows the increase of interest in the field. She also gave thanks to IGES, the hosting organization, and to the Environment Agency, the APN, and other sponsoring organizations.

The second speaker was Prof. Akio Morishima, who is the Chair of the Board of Directors of IGES, the host of the 99 Open Meeting. Prof. Morishima emphasized the importance of the 99 Open Meeting in the field of global environmental research, and thanked each member of the ISPC for contributing to the planning and organizing of the meeting. Then he described the content of research carried out at IGES, and thanked the Environment Agency, the APN and other sponsoring organizations.

Lastly, a speech was given by Mr. Hironori Hamanaka representing two sponsors of the 99 Open Meeting. He is the Direcotor General of the Global Environment Department of the Environment Agency of Japan, and the Chairman of the Inter-Governmental Meeting of the APN. Mr. Hamanaka began by expressing his anticipation of the role of the 99 Open Meeting as a step towards solving global environmental issues, and went on to explain the active involvement of the Japanese government in urgent tasks such as climate change issues and the effective use of energy. In addition, he pointed out the importance of the role of science and technology in making various policies, and said that it is in this context that the APN, an inter-governmental network of Japan and other Asian countries, decided to support the meeting financially. Mr. Hamanaka then went on to explain the tendency in recent studies of the global environment, which is to emphasize the importance of combining natural and social scientific approaches. In this context, he said he believed it was appropriate to have the themes of "Land Use/Land Cover Change" and "Conflict and the Environment" in the meeting. In addition, since this meeting will be the first meeting to be held in Asia, he expressed his anticipation that it would contribute greatly to advancing global environmental activities in Asia and to deepen understanding between different groups: policy-makers, private companies and the public. Finally, he concluded by expressing hope that the 99 Open Meeting would be an effective step in building an international network of researchers, and in advancing the research activities of the field.

2. Plenary Talk

Plenary Talks were held in all sessions except Session 4, and were held in Dazai-Hall of Lofos Shonan. Each talk was on one of the five major themes of the 99 Open Meeting. Each Plenary Talk consisted of a speech followed by comments on the speech, made by leading scholars of the field.

The outline of Plenary Speeches and Comments is as follows:

1) Session 1

Time/Date: 09:30-10:30 June 24, 1999
Theme: Land Use and Land Cover Change
Chair: Lisa Graumlich, the University of Arizona (a member of ISPC)
Speaker: Diana Liverman, Latin American Area Center of the University of Arizona
Commentator: Shidong Zhao, Chinese Academy of Science

Summary of Plenary Speech

As the world approaches the millennium the rate and intensity of land use land cover change remains high in many regions, having significant impacts on global and regional environmental conditions. It is in this context that Diana makes her presentation wherein she has assessed the progress made in understanding the patterns of land use change and further, examines the important challenges and research opportunities in this field of study.

In Mexico, where most of her research is based, average rate of deforestation is more than 2% a year, pasture area has increased by 25% in the last decade and further intensification of land use has included doubling of irrigated area and fertilizer use in the last 30 years. Such changes have increased Mexico's greenhouse gas emissions; changed regional climate patterns and threatened the overall sustainability of people's livelihoods. It is such large-scale changes that have promoted scholars to develop coordinated programs to monitor, understand and model land use and land cover dynamics. The last decade has seen considerable progress in this direction including – Placing land use and land cover change at the core of the overall global change research agenda including an accepted role for social sciences.
Increasing number of social scientists and stakeholders are now taking advantage of new technologies of remote sensing and geographic information systems to understand land use patterns.
The development of conceptual frameworks that provide a more nuanced analysis of the IPAT driving forces of population, technology and consumption and also address other important drivers such as institutions and cultures.

The organization of international collaborative and comparative projects, one such program is the Land Use and Land Cover Change or -LUCC Initiative- convened by the International Human Dimensions Program and IGBP and is now a full fledged project

with science and implementation plans, core project offices and dozens of affiliated projects in different regions of the world.

The main objectives of LUCC are to obtain a better understanding of global land use and land cover driving forces; to investigate and document temporal and geographical dynamics of land use and land cover; to define the links between sustainability and various land uses; and to understand the inter-relationships between LUCC, biogeochemistry and climate.

In rest of her talk Diana talks about some of the formidable challenges which land use and land cover change research is facing today.

Firstly, one of the great challenges is how to handle scale. The question of scale arises at every stage of the research: in deciding on the units of analysis for original data collection or in identifying the scale constraints of existing data; in linking global processes to regional policies and to community, household and individual responses; and in demanding flexibility from geographic information systems when scale changes or has uncertain boundaries as in issues of migration. We also need to recognize that scale is culturally constructed by the legacy of political boundaries, institutional organizations and ways in which the social and ecological phenomena are classified and aggregated. Besides the scale of analyzing problem, we also need to recognize different socio-economic processes and institutions that operate and influence land use at different scales.

A second challenge is to capture and understand the role of spatial and temporal variability in land use and land cover change. There has been a tendency to search general conclusions and predictability to focus on larger scale regional trends rather than on the heterogeneity of local land uses and processes or the seasonal and interannual fluctuations in land use and cover. Extreme climate events, such as those associated with El Nino, and rapid shifts in economic policy associated with trade shifts and currency collapse can produce dramatic shifts in land use, such as the recent loss of forests in Mexico and Central America associated with fires and hurricanes. Similarly the tremendous variations in physical and cultural conditions across countries such as Mexico produce highly varied patterns of land use, even when the major driving forces for change are larger scale economic forces or national land tenure or market institutions.

Third challenge is regarding the use of new technologies of remote sensing and GIS in appropriate and efficient ways. In most of the studies, too much project time, resources and manpower is spent on analysis of satellite images and development of multi-layered, multi-temporal geographic information systems without any clear set of questions or modeling processes. We lack good methodologies of linking the data to less quantifiable processes at both local and global scales. Thus the imperative need for today is to include social processes like household responses and local knowledge into our geographical information systems and to develop systems that can be vital inputs to the actual decision making.

The fourth challenge is to link our study of global environmental change to the vigorous field of globalization studies in the social sciences. Though there is still some debate over the definition and extent of globalization, it is clear that new trends in international trade and markets, the establishment of global institutions such as the World Trade Organization, and economic restructuring through neoliberal national policies is having important implications for land use and land cover. In Mexico, for example, the simultaneous implementation of NAFTA, land reform, privatization of water and primary resource industries, withdrawal of state subsidies, and economic instability associated with new global financial and commodity markets has produced rapid and rather unpredictable land use and land cover changes. At the same time, political democratization, the decentralization of regulation, changes in consumption and the rise of social movements have further complicated the local impacts of and responses to globalization.

The final challenge, as discussed by Diana, is that of implementing truly collaborative and carefully comparative research programs. Comparative studies need to develop rigorous frameworks for comparison, generalization and for the identification of singular local conditions including both quantitative and qualitative components and common protocols for data collection and analysis. Collaborative projects must find ways to fund, develop human resources and take advantage of local knowledge in different regions, and to involve stakeholders and enable research partners to influence local and international policies.

In conclusion, the speaker emphasized upon the need to evolve a comprehensive view of social sciences including human behavior, political institutions, demography and economic predictions, while addressing the issue of land use and land cover change as it

relates to the overwhelming concerns of basic human survival and well being.

Summary of Chief Comment

Largely agreeing with the challenges to research on land use and land cover change, as outlined by Diana, Dr. Zhao talks on this issue more from the perspective of developing countries. In most of the developing world we need to evolve interlocked research community as environmental challenges are intrinsically intertwined with social challenges. As the present global and national level land use policy making is not able to meet the local needs towards transition to self ability, hence newer challenges are being raised – how should policy-making respond to facilitate this transition; how to promote land use policies which simultaneously enhance land sustainability and also meet the national/global goals of sustainable global system. In order to meet these challenges, Dr. Zhao recommends that the LUCC research should be focussed along the following points:

- Proper data management, including data collection, sharing and archiving, can be a vital contributor to the success of LUCC research.
- Adopt integrated and inter-disciplinary research approach using analytical technologies like GIS and remote sensing system models.
- Strengthen partnerships between developed and developing countries.
- Education of development agencies for a need to integrate approach to land resource development projects building from LUCC research principles.

The following session of questions/comments from the audience was largely focussed around the issues of globalization and its impact on LUCC research. Issues like disintegration of the social web due to rise in global /regional crime and its impact on land use were raised. Agreeing with such concerns, Diana gave examples of problems encountered by her students in the field where at times, even the personal security of researchers is at stake. In relation to its impact on land use, the issue is of the enforcement of land use legislations and the inability of the government to check this implementation. Now as in many countries environmental management is being decentralized, therefore onus also lies on the local communities to check land use patterns.

2) Session 2

Time/Date: 14:30-15:30 June 24, 1999
Theme: Demographic Change and the Environment
Chair: Ronald Rindfuss, the University of North Carolina (a member of ISPC)
Speaker: Wolfgang Lutz, International Institute of Applied Systems Analysis
Commentator: Naohiro Ogawa, Nihon University Population Research Institute

Summary of Plenary Speech

Demographic changes have always been intimately interwoven with the natural environment. It is this relationship between population trends and global environmental change that constitutes the main theme of Dr. Lutz's presentation.

Though in recent years many specific population – environment studies have been undertaken, but in the speaker's opinion, it is still very difficult to come up with any generalizable conclusions about the very nature of these complex interactions. He begins by outlining the three different levels of analysis at which the issue of demographic change and environment should be addressed. Firstly, one must study the impacts of demographic change on the environment, both direct and indirect impacts. Secondly, how do the different aspects of environmental change, like health, migration etc., effect the demographic trends? Thirdly, population figures are vital in the negotiations for entitlements of natural resources per person. Also the various issues and mechanisms of these interactions vary significantly at the global and regional levels of analysis.

The term population needs to be discussed in specific terms of demographic change i.e.; the quantitative aspects of population which are structured by varying variables of size, education, spatial distribution, migration etc, while the broader human impacts on environment should involve the analysis of institutions, economics and culture. In his opinion, the demographic change is at the interface between natural sciences and social sciences and thus can serve as a vital bridge between these two different paradigms of research. Discussing some of the approaches to quantify the environmental impacts arising out of demographic trends, he talks about the Identity equation of I=PAT i.e.;Environmental Impact = Population Size x Affluence x Technological Efficiency. But not fully convinced by this equation, he highlights some of its drawbacks:

- Three factors included in the identity are arbitrary, rather other factors like number of households should be included.
- The three factors of P, A and T are not independent of each other.
- Feedbacks from impacts on P, A and T are possible which, inturn, are likely to influence the results.
- This equation is not equipped in dealing with negative growth in any one the factors.

Regarding future projections on population trends, its certain that world population will age and grow substantially with its distribution continuing to tilt North to South. But there are also major uncertainties on aspects like population stabilization, mortality and how would the world population size be influenced due to the speed of LDC fertility decline.

In his efforts to evolve a more comprehensive approach which is structured enough to facilitate a comparative analysis across different ecosystems, cultures and stages of economic development, he begins with the assumption that population is not independent of environment as human species are a part of the nature and cannot exist without the environment. And the population is embedded in the socioeconomic sphere of development (comprising of consumption, production and other social economic activities) which further operates within the broader framework of environment which is under the impact of key elements of land, water, air, energy and other living species. Amongst the various case studies that have been launched using this population –development -environment framework

Dr. Lutz talks about the PEDA model (Population-Environment-Development-Agriculture model) which is being developed in Africa under the aegis of UN Economic Commission for Africa.

Towards the end, he draws some conclusions about the course of future research in order to improve the understanding about these complex interrelationships between demographic change and environment. To be able to overcome the confusions that exist in terms of methodological approaches and variables used, the focus should be on methodological rigor, to try to use at least comparable variables measured in a comparable way in a series of isomorphic studies in different settings. This strategy, however, would require some coordination between researchers in the field and a basic agreement about the methods and paradigms to be used. Another easier and much more popular (although less efficient) strategy is to "let all flowers bloom". In order to

increase the general understanding about population-environment dynamics, there is also the need to find better means of communication between the different groups working in the field so as to be able to avoid repetition and overlapping of research efforts. One should be specific in terms of data and models used. Such research methodologies and frameworks should be developed which are truly inter-disciplinary and multi-disciplinary.

Summary of Chief Comment

To begin with, Dr. Ogawa expresses his concerns about the actual reliability of the various future population growth projections that have been made so far, describing most of these projections as more of a speculative exercise. Thus, emphasizing the need to fill up these gaps, he acknowledges the efforts of demographers like Dr. Lutz, who in recent years, have made notable contributions in evolving models for more reliable population projections. Referring to the report published by the National Science Academy in 1996, he indicates that there are a numerous unknown linkages between population change and socio-economic development including environmental practices. Speaking from his own experience of being involved in modeling for many years, he highlights some of the practical problems which need to be addressed by demographers. Firstly, while carrying out studies on population predictions there is often the problem of instability of coefficients. Secondly, there are vital missing linkages due to lack of data and improper models.

Not fully convinced by the I=PAT model, he suggests that further research and analysis should be carried out to back up the validity of this simple framework. Commenting on the point raised by Dr. Lutz about including other factors like number of households in the I=PAT equation, and applying it to the Asian context, Dr. Ogawa is of the view that just considering the number of households would not be enough as in Asian societies the dynasty system operates wherein there is a prominent flow of resources through strong inter household and inter generational linkages.

Speaking further on some points missing in Lutz's presentation, he is of the view that population changes could also impact upon environment through capital deepening effect as witnessed in some Asian countries which have had a rapid decrease in fertility rates while undergoing tremendous economic growth. Similarly, changes in lifestyle

can also be an important factor in determining the impacts of demographic change on environment.

Towards the end this plenary session was marked by heated questions from the audience. A researcher from China expressed concerns about the impacts of cultural attributes of demographic change like language, religion, history etc. on environment and how could these impacts be accumulated in Dr. Lutz's model. Accepting the significance of these cultural dimensions Dr. Lutz spoke about the quantitative approach in demographic studies where people are grouped into different categories on basis of their cultural preferences assuming that within each group there is some homogeneity. And models are formed on basis of these groups.

Speaking about the specific socio-economic conditions in some developing societies, an audience commented that its not only affluence that influences the fertility rates as at times families are forced to reduce the number of children even due to hardships.

3) Session 3

Time/Date 09:00-10:00 June 25, 1999
Theme: Decision-making Processes and Global Environmental Change
Chair: Elena Nikitina, Russian Academy of Science (a member of ISPC)
Speaker: Akio Morishima, Institute for Global Environmental Startegies
Commentator: Elinor Ostrom, Indiana University

Summary of Plenary Speech

Professor Akio Morishima's speech is concentrated on the various national and international linkages within the decision making process regarding global environmental issues, on its vertical dimensions and institutional interplay.

He begins by outlining the various characteristics of global environmental issues that effect its decision-making at the national and international levels.

Firstly, environmental problem is a long-term phenomenon, having a gradual, indirect impact spanning over a long period of time. As at times it takes decades for a

problem to appear on surface therefore, the policy makers are often refrained from taking timely decisions in this respect.

Secondly, global environmental problems are wide in space and regard no geographical and civilizational boundaries. For example, within a country the CO2 emissions might come from numerous sources like industries, household consumption and transport sectors which, in sum, contribute to the global climate change scenario. Thus its very difficult to evolve control measures as due to the wide range of integrated causes, the extent and nature of problem varies from country to country.

Thirdly, environmental issues are characterized by scientific uncertainty. Causes of environmental disruptions are multiple and therefore usually they are not clearly identifiable. Mechanism of causal linkages is scientifically unclear. Due to this scientific and technological ambiguity the evaluation of risks varies among policy makers. Thus it's difficult to evolve a consensus about the policy alternatives and technologies to be adopted.

Fourthly, environmental issues are intrinsically linked with issues of national economy. An environmental value often clashes with the economic value. Investments in environmental protection are often perceived as a burden on national economy.

In view of these characteristics of global environmental issues, there is no decisive, persuasive criterion to choose from amongst the various policy alternatives.

Though global environmental issues have ramifications beyond national boundaries but the policies to monitor these issues are ultimately formulated at the national levels. In absence of an international government, the sovereign power is vested in hands of each national government. Consequently, the international policy making process is strongly marred by the conflicting interests of sovereign nation states. To elaborate this point, Prof. Morishima spoke in detail about the negotiation process at the Climate Change Convention's COP3 Conference in Kyoto which was a good illustration of how national interests have hindered consensus building for a global policy on GHG reductions.

He ends his speech by indicating at some priority areas where efforts should be focussed to evolve a desirable decision making process for future generations.

Firstly, there is an urgent need to fill in the gap of scientific uncertainty by providing an objective scientific data on environment and policy alternatives. Here he

applauded the Climate Change Assessment Reports of IPCC. Such objective research can, to a greater extent, narrow down the scientific uncertainties if not solve them completely.

Secondly, the invigorating role of NGOs and public opinion is also emphasized upon. Government must promote support structures for non-governmental, peoples' institutions in order to evolve environmentally sustainable development models.

Thirdly, the discipline of social sciences must expedite its efforts to develop newer social-scientific methodologies such as environmental accounting, to cope up with global environmental issues and thus provide more sound bases for negotiation.

Summary of Chief Comment

Dr. Ostrom as the chief commentator for this plenary session spoke largely about the US reflections on this process of decision making. She begins by outlining the two striking characteristics of Common Pool Resources (CPRs) - firstly, it's difficult to exclude people from using the various natural resources. And secondly, one person's use is a subtract from the availability of others.

There are a variety of attributes of these resources which further make their management more difficult. To enumerate a few:

- what is the size and carrying capacity of a resource ?
- what is its temporal and spatial distribution ?
- Whether its mobile like fish or stationary like trees?
- What is its speed of regeneration?
- How measurable are the benefits coming from it?

As these attributes suffer from tremendous scientific uncertainties thus its further problematic to frame rules to match these varying dynamics. Whether there is a substantial capacity to manage CPRs at the regional levels depends on the broader social settings of these resources. Higher levels can provide more information and arenas for conflict resolution but at times that can also hinder the local self-organizations by defending rights that lead to over use.

In the speaker's opinion humanity is now facing newer challenges for managing

the various ecosystem services. These challenges are especially arduous for the following reasons:

Scaling up problem – larger number of participants in CPRs introduces the difficulty of framing rules and enforcing them.
Challenges due to cultural diversity – there are a diversity of ways in which peoples have organized themselves and sustained over the ages. But this diversity also reduces the likelihood of finding common understandings as exacerbated in the north – south conflicts.

It is difficult to reach a unanimous agreement amongst countries. As it's voluntary on part of nations to negotiate a treaty – this allows some countries to hold out for some special privileges before joining a treaty.

Complications of interlinked CPRs – there are strong interlinkages between different CPRs like grasslands, forest resources and biodiversity ecosystems. In view of these natural synergies, its very difficult to develop a holistic approach to global environmental management and achieving an effective policy coordination between various MEAs.

Speaker ends on the note that building better communication – information networks, evolving multi-level institutions and trust can serve as vital starting points to overcome the above mentioned challenges.

Following these comments a question was asked about the level of transparency in Japan's decision making processes. Reacting to this, Prof. Morishima said that the Japanese government has adopted some measures for transparency and public participation in policy-making. For example, the proceedings and data materials of the Central Council of the Environment, an environmental policy-making advisory committee for the government, have been opened for the public since 1995. It also receives public comments and hold public hearings before finalizing its policy proposals. Though he also expressed the need to strengthen this transparency further by giving legitimate status to NGOs.

Another comment was about the existing sectoral divisions in different discussion forums on issues like climate change, biodiversity and drylands inspite of the fact that all these issues are closely contingent upon each other.

4) Session 5

Time/Date: 09:00-10:00 June 26, 1999
Theme: Conflict and the Environment
Chair: Roberto Sanchez, University of California Santa Cruz (a member of ISPC)
Speaker: Michael Redclift, Keele University
Commentator: Eduardo Viola, University of Brasilia

Summary of Plenary Speech

Reviewing the development process over the last fifty years and then discussing its newer discourses of globalization and modernity, Dr. Michael, in his presentation tried to examine the origins and issues of present conflicts over environment. Looking at the security concerns over environment, he analyzed the effects of environment on peoples' livelihoods and of peoples' livelihoods on the environment, starting from both international and local conflicts.

He begins by outlining the major principles for securing international agreement on Global Environment Change (GEC), focussing on the background processes that influence our capacity to reach an agreement internationally.

Firstly, though all countries and human societies are stakeholders in the problem and equally responsible for finding solutions to it, but still the reality is that large sections of human population are still plagued with conditions of destitution and poverty.

Secondly, sustainable development is an objective that needs to be given priority over economic growth.

Thirdly, GEC carries implications for the management of Global Commons - the collectively owned and accessed resources whose conservation is in everybody's interest.

In speaker's view, various conflicts over environment lie along the following broad categories:

- conflicts over development priorities, with distinctions between the priorities of the South and North, which he refers to as poverty ecology and wealth ecology respectively
- conflicts over global environmental damage which is often depicted as livelihood and lifestyle emissions.
- conflicts over ways of sourcing the current consumption levels of natural resources

and its consequences.

- conflicts over pollution and waste generation and the use of appropriate technologies which seek to internalize the environmental costs on this account.

Reviewing from the perspective of the end of this millennium, the post-war development decades seem to be historically confined and politically contingent. Last 50 years witnessed major processes like Decolonization which paved way for newer, crosscutting economic relationships. Following the collapse of the cold war there has been an unprecedented increase in global military expenditure that is now concentrated more in the countries of the South. As regards energy consumption, past years especially offered cheap energy prices without realizing its long-term impact.
But now these historical events are gradually been replaced by newer trends of globalization and modernity.

Globalization has brought about greater convergence of economic relations and has created ideological uniformity in terms of uniform economic goals. But simultaneously, this has also generated greater competition between different economic and political interests to secure these goals. Consequently, there is also increased debate about the problems arising out of the socio-environmental impacts of these emerging global markets and newer regulations – deregulations which need to be addressed. But on the other hand, globalization also seems to be a paradox in itself as people are opposing its cultural homogeneity and rather seeking newer convergent identities. Rising Islamic fundamentalism or social unrest in transitional economies is a testimony to this paradox.

Modernity is natural fallout of globalization. Specialized information technologies are introducing marked spatial and temporal shifts in communication networks across defined physical spaces. Expert knowledge is rapidly replacing local, indigenous knowledge. But its implications on public trust and the risk factor involved are being questioned.

In wake of the unanticipated environmental problems that we inherited from the past years, the focus is now shifting towards global sinks. A new geopolitics in the sphere of environment is developing, based on different kinds of issues like water security, climate change politics or politics around biogenetic issues. The speaker is of the opinion that as environment emerges as the new battlefield, the issues for future

would be focussed around following questions:
accumulation, value and sustainability : can global markets deliver both environmentally and socially sustainable development ?
modernity : can global systems of communication and consumption deliver a locally legitimate knowledge while also making space for diverse practices ?
what would be patterns of future governance and how deliberative and participatory would the democracy be ?

In an attempt to examine the various dynamics of conflict and environment, Dr. Michael has outlined the following spheres of activity in which the competition for environment takes place:
a) the spheres of production in which most people spend their working lives.
b) the sphere of consumption in which their everyday practices, needs and consumer choices are expressed.
c) the sphere of social capital, which supports economic activity, the "supply side" of the environmental equation.
d) the sphere of nature, in which we relate to other species and to the wider systems represented by the countryside and wilderness.
e) the sphere of physical sustainability, the climate systems and ecological systems linked to climate and biodiversity: coastlines, watershed forests, drylands etc.

In conclusion, speaker emphasized the urgent need to examine as to what would be the new bases of security, a viable concept of security which addresses the crucial issues of environmental destitution and degradation.

Summary of Chief Comment

Dr. Viola as the chief commentator for this plenary session largely agreed with Dr. Michael's views that the contemporary societies are severely plagued with conflicts in relation to environmental issues. Rather these conflicts are now being expressed in more dramatically and complicated ways due to the rising complexities of our society.

Taking the discussion a little further, he added the following dimensions to it:

The post cold war era is witnessing a total transformation of global system based on

international conflicts to a system based more on intra-state and transnational pattern of conflicts. Its pertinent to understand these transnational conflicts as they are posing formidable challenges in the process of building up coalitions for environmental regimes. Such transnational conflicts are further leading to a segmented pattern of globalization wherein national segments of society are rapidly being globalized while the marginalized segments remain unglobalized due to lack of competitive capabilities and productivity.

A globalized civil society based on networks of NGOs and TNCs is emerging. It is these globalized forces including the inter-corporative and intra-corporative forces that are very crucial at the core of environmental issues and are oriented towards the hetroduction of the prevailing unsustainable model of development. Thus these reformist forces are trying to redefine the current global order and making it more oriented towards long term sustainability.

But simultaneously strong nationalist forces are also on a rise which are resisting this ongoing process of globalization. A kind of coalition is evolving between these nationalist forces and global conservative forces in opposition to the reforms brought in by new regimes and structures for global governance.

Towards its end, this plenary session was marked by a heated question-answer session. The questions/comments were largely focussed around the process of globalization – its varying dynamics and impacts.

Contrary to Dr. Michael's views that there is increasing resistance to the cultural homogeneity of globalization, a researcher from Australia National University was of the view that resistance is actually against the economic impacts of globalization. In support of this view, she quoted her experience of working in Indonesia where ongoing social unrest is being portrayed by the government as ethnic conflicts. But in reality it is the peoples' opposition to the government's policies of globalization under which their lands are being deforested and turned to oil production. She was also of the opinion that the whole idea of decentralization and empowerment of local people in the decision making process is a complete eye-wash as decision making is actually governed by the trade interests of TNCs, operating in a given area.

Replying to these comments, Dr. Michael agreed about the rising resistance to the economic processes of globalisation as preservation of their livelihoods continues to be a

vital concern for majority of the world's populace. He also emphasized the need to study the micro interactions at local levels and the kinds of processes that are threatening the very survival of people.

A question was also raised about the dynamics of capitalism in relation to globalization and if there exists an increasing element in capitalism that is tending towards sustainable development. Reacting to this Dr. Michael was of the view that globalization could perhaps be interpreted as one of the stages of capitalism.

Adding another dimension to the causes of conflict over environment, an audience was of the view that conflicts arise due to the disparity in equity in terms of natural resources available to a nation and its actual access to those resources. Agreeing to this fact as a major underlying issue, Dr. Michael said that due to disparities in equity, its difficult to get fixed commitments from people and therefore, we must identify areas in transnational world where disparities are more intense and try to narrow them down.

5) Session 6

Time/Date: 14:00-15:00 June 26, 1999
Theme: Valuation of Ecosystem Services
Chair: Youba Sokona, Environnement et Development Programme Energie (a member of ISPC)
Speaker: Leena Srivastava, Tata Energy Research Institute
Commentator: Hans Opschoor, Institute of Social Studies

Summary of Plenary Speech

While it is being universally accepted that ecosystems are essential to human existence, it is also being argued that the various natural capital services derived out of these ecosystems are not being correctly valued. As a result the importance of maintaining the balance of the ecosystem is not reflected in the policy decisions and day to day economic activities. It is in this context that Dr. Leena makes her presentation, dealing with various issues involved in assigning values to ecosystem services.

She begins by reviewing the conclusions of Dally, Maller and Constanza who have

done some work in the past few years for estimating the values assigned to various ecosystem services. The economic valuation of ecosystem services largely focuses on their use value – comprising of direct, indirect and option values associated with a particular ecosystem service; and the non-use value representing the bequest (value assigned to a resource so as to preserve it for the use of future generations) and the existence values. There are several valuation methods that are used to calculate the economic value of ecosystem services such as, market price based valuation or a surrogate market valuation, contingent valuation method or a multi – criterion based analysis.

Such a valuation exercise helps in ensuring that we are not moving towards unsustainable growth patterns. It can also be useful in the following other ways:

- To assess the importance of environmental ecosystem services in national development priorities.
- To integrate these values into the gross national product which otherwise measures only the economic functions in the formal sectors of economy.
- Valuation is an important tool for program and policy evaluation and determining its effectiveness vis- a- vis the environment.
- Valuation can also be very useful for 'grounding ' sustainable development.

But in the speaker's opinion, such a valuation exercise can also become a potential source of conflict as placing a value on ecosystem services might prominently highlight the negative implications of one set of activities on a completely unrelated set of activities. Such conflicts can be avoided only by simultaneously internalizing the implications arising out of valuations into the policy making process.

Another associated question is that whose values are being looking at. In this context, firstly, the intergenerational issues are important, as these ecosystem services span over generations, so are we competent enough to place a value on them on behalf of the future generations. Secondly, the intra-generational equity issues- the process of assigning values to the natural resources and then taking a decision on the basis of these values is also influenced by numerous other factors like differences in terms of power structure, inequalities in income standards, difference in perspectives of global or local populations and the associated interests.

Examining in the particular context of developing countries, the following factors

further influence the valuation process:

In the developing countries, owing to the population's heavy dependence on the ecosystem services for their basic subsistence needs, the discounting factor to the value provided by ecological resources is quite high compared to the developing countries. Populace in developing countries is poor and illiterate to comprehend the complexities of the functions provided by specific ecological services.

Developing countries lack technology alternatives therefore, the adaptive capacity of their population is very low and is highly vulnerable to impacts of climate variations. Most of all, in these countries the willingness of the people to pay for the services drawn from the natural resources is very low. In addition, several other factors like socio-cultural structures, income levels, historical and institutional factors also have to be given due to consideration while valuing the ecosystem functions.

Various issues associated with the valuation of the ecosystem services can be well understood in the specific context of climate change problem. The issue of climate change combines in itself both, the inter and intra-generational problems arising from the fact that GHG gases have a long life span in atmosphere. Climate change also highlights the pluralistic nature of environmental problems and especially the problem of aggregation across various environmental and natural resources. Climate change combines in itself several transboundary issues and clearly magnifies the complexities involved in valuation of ecosystem services - it does not involve one ecological function in isolation, rather reflects the interplay between different ecological functions. Thus while assigning a value to climate change all these inter-linkages have to be taken into account. In view of this complex nature of the climate change problem several controlling measures such as mitigation options and assessment of impacts and vulnerability are being proposed. Climate change debate can be better addressed by undertaking a proper valuation exercise for each of these control measures.

Dr. Leena concludes her speech by raising the following points of caution:
While understanding the valuation of natural capital services, we need to be careful about the geographical applicability of the values arrived at; the time dimension of these values as they are likely to change with passage of time, growing incomes and also growing scarcities.

One must correct the biases and underestimations that are likely to arise, especially in developing countries. While undertaking the valuation exercises in these regions, the response from people are in the context of their living conditions and

therefore, there is a clear fear of underestimation of values placed on the resources.

Correct estimation of the value of life - if human beings are also to be considered a part of the global ecological resources, then the value of life should really reflect the potential the human beings hold for being able to contribute to the global economy. And the values that are then assigned, must also reflect this particular estimation. Finally there must be recognition of the fact that these are global services, provided by our natural resource endowments and therefore, there must be a global willingness to pay with a sense of differentiated responsibilities.

Summary of Chief Comment

Largely agreeing with the issues raised by the plenary speaker, Dr. Opschoor's comments focus mainly on examining the viability of the economic approach to the valuation of ecosystem services. He begins by making a distinction between the instrumental and intrinsic values of natural resources. Economic valuation well captures the instrumental values but cannot evaluate the intrinsic values and various other carriers, regulatory and production functions which the ecosystems perform for human beings. Elaborating further, he highlights the following gaps in economic approach to the valuation of ecosystems:

Firstly, the mainstream economics is based on the foundations of methodological individualism and utilitarian approach to the valuation process but these approaches are not uniformly applicable across the globe to all societies. Secondly, the economic valuation is based on the assumption that market behavior and market prices fully capture the relevant values. But this again is not universally applicable as in some parts of the world modern markets are yet to penetrate or define the social behaviors. Thirdly, inter-generational aspects of environmental issues also remain unanswered in the economic approaches to valuation. Though it does talk about the overlapping generation utility function but that doesn't fully reflect the interests of future stakeholders.

Thus, while the given state of economic valuation of ecosystem services is useful in defining the externalities in the current generations and is also rich in methodologies, but the above mentioned gaps in market assumptions can be covered up by adding

socio-ecological and participatory approaches to resource assessment and appraisal.

The questions and comments raised towards the end of this plenary session were focused mainly on the issue of assigning a value to life. A researcher from India disagreed with Dr. Leena's contention of making a divide between developed and developing countries while determining the value of natural resources and was of the view that instead it is the cultural dimensions that are more prominent while addressing such issues. Further in his opinion, assigning a value to human life is not proper, as that would not be acceptable to those who view life in context of a holistic ecosystem process. Responding to this, Dr. Leena agreed to the significance of cultural divisions which at times, influence values even within the set of similar societies. Agreeing to the fact that value of life is a contentious issue but again, its something which cannot be avoided as for example, policy makers do make decisions on matters like public health and safety. Also, within the climate change assessment reports, the valuation of damages to human health are being undertaken.

3. Parallel Sessions

A total of 47 parallel sessions were held in eight rooms during the three days of the 99 Open Meeting. Each session comprised two to four presentations on the most recent research results, and 178 presentations were made in total. There was active exchange of opinions between the presentators, and between the presentators and the audience. The content of each presentation is printed in the Abstracts Volume.

4. Poster Session

Time/Date: 14:00-15:00 June 25, 1999
Venue: Conference Lobby, Shonan Village Center

Throughout the meeting, posters by twelve authors were exhibited in the lobby of Shonan Village Center, and the authors had a chance to explain their posters on the afternoon of the second day. A computer demonstration was also conducted at this time. There was a large audience in the lobby during this period, and the authors of each poster answered questions and exchanged opinions with the audience. The abstracts of the posters are also included in the Abstract Volume.

5. Closing Session

Time/Date: 17:30—18:30 June 26, 1999
Venue: Dazai-Hall, Lofos Shonan

The Closing Session was chaired by Dr. Jill Jaeger, a co-chair of the ISPC. Speeches were given by Prof. Uno Svedin of the Swedish Council for Planning and Coordination of Research, and by Dr Eckart Ehlers, the Chair of the Scientific Committee of the IHDP. After the speeches, the chair solicited opinions from the audience, and active exchange of opinions followed. The meeting ended with a closing speech by Dr. Shuzo Nishioka, the other co-chair of the ISPC.

The first speech was given by Prof. Uno Svedin. He started by praising the success of the 99 Open meeting, and said that he noticed that the Open Meeting is increasing in number both in themes and participants. There are seven points he thinks should be considered for the future meetings, which are: 1) that we need to go South, 2) that we should consider for whom and by which methods the issues could be addressed, and that there is a need for reinvestigating current beliefs, 3) that we should handle the discussions that are still developing in a challenging way, 4) that we should reintroduce the issue of balance between the convergence and divergence, 5) that it has become clearer that there is a tendency to bring social and natural scientific approaches closer together, 6) that although we are now aware of the necessity of filling the gap between social and natural scientific approaches, it has still not been accomplished, and 7) that there is a need for synthesized work in the future.

The second speech was by Prof. Eckart Ehlers. He began by expressing his appreciation of the work of IGES, the host, and the Environment Agency of Japan and APN. He also praised the hard work of the two co-chairs of the ISPC, and the members of the Japanese Local Organizing Committee. Then he commented on the future of both human dimensions research in the field of global environmental change in general, and the role of the IHDP in the Pacific, from the points of view of organization and science. Regarding organization, Prof. Ehlers stressed the importance and necessity of natural and social scientific approaches to be synergistic and united. From a scientific view-point, he emphasized that researchers dealing with environmental change should conduct experimental scientific research with the following three aspects in mind: 1) to focus on the generalization potential of the many valuable local or regional case studies, 2) to down-scale global models used in current scientific research, and to develop smaller models to enhance problem-solving potential,

and that 3) the task of social scientists in global environmental research is to ensure cultural diversity issues with special reference to ecological as well as economical North-South and East-West responsibilities. Finally, Prof. Ehlers introduced "Congealance", a recent publication by Edwin O. Wilson, and said that the 99 Open Meeting has been a significant step forward towards the goal of unifying the natural and social sciences, and that everyone is looking forward to the future consolidation of the research community with its ultimate goal to contribute not only to a better understanding of the earth system, but also to its maintenance and improvement.

After the speech by Dr. Ehlers, questions and comments from the participants were praised and discussed. Concerning the administration of the Open Meeting, these two comments were put forward by the participants: 1) The number of themes and parallel sessions should be reduced, so that more time can be spent on one presentation, and that there can be effective discussion in the sessions, 2) The selection of the paper should be made more strictly from the content of the whole paper, and not from the abstract, in order to improve the quality of presentations.

Following these comments, discussion on these three points followed: 1) Because the Human Dimension Program includes so many fields, the purpose of the Open Meeting was to promote exchange of opinions between different fields, and to have various kinds of presentations from as many fields as possible, 2) Unlike the previous meetings, we were able to grasp the overall impression of the Open Meeting from the book of abstracts. However, if submissions of whole papers were to made instead of abstracts, it would consume too much preparation time and expense. This defeats the purpose of making the meeting as inexpensive and practical as possible. If the registration cost rises, it may result in a decrease in participation of young researchers and participants from developing countries, and 3) If the object of the meeting is to keep it open to everyone, and have large participation, what we had at this meeting may be left as it is, and the majority of participants expressed agreement with the opinion that the style used at this meeting of attracting many participats was better than having a more closed meeting.

Lastly, Dr. Shuzo Nishioka made the final speech. He started with quoting an old Japanese poem about the art of tea ceremony: Although there are many different methods of serving tea, the aim of everyone in the tea ceremony is to enjoy the quiet spirit of the tea. He said there may be different approaches to the human dimensions aspect of environmental change, but everyone is moving towards the same goal. What each researcher has may be only a fragment of knowledge, but to unify these fragments together will enable a productive result. This unification should not be a result of

controlled centralization, but should be based on a network of individual research. Summarizing the whole meeting, Dr. Nishioka expressed his gratitude that the 99 Open Meeting ended quite successfully, and mentioned that the fourth meeting would be held possibly in 2001 somewhere in the Southern Hemisphere to continue the successful series. He revealed to the participants that the Transition Committee had been established to prepare for the fourth Open Meeting, and that the Committee will be responsible for recruiting the host organization for the next meeting and the selection of the new ISPC. He ended by thanking IGES, who was the host, the sponsoring organizations including the Environment Agency of Japan and the APN, and encouraged everyone to meet again at the fourth Open Meeting in 2001.

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1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community

Shonan Village, Japan
24-26 June 1999

REPORT

International Scientific Planning Committee of 1999 Open Meeting

Hosted by IGES

1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community

REPORT

Shonan Village, Japan
24-26 June 1999

Organised by

International Scientific Planning Committee of the 1999 Open Meeting

Co-Sponsors

Institute for Global Environmental Strategies (IGES)

Environment Agency of Japan

Asia-Pacific Network for Global Change Research(APN)

Other Sponsors

International Human Dimensions Programme on Global Environmental Change (IHDP)

US National Science Foundation(NSF)

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Objective

An Increasing number of researchers are interested in the human causes and impacts of global environmental change, as well as recognizing that local and regional scales are critical for their studies. In response to the interest, the International Scientific Planning Committee(ISPC) has organized an international Open Meeting in the Shonan Village of Japan in June 1999. The Meeting follows the successful international meetings of members of the research community held at Duke University in 1995 and at IIASA in 1997. The 1999 Open Meeting aims to promote exchanges of information on current research and teaching and to encourage networking and community building in this emerging field.

Major Topics

- ❑ Conflict and the Environment- the interaction between conflict prevention and resolution and environmental issues
- ❑ Decision-making Processes in Response to Global Environmental Change- in particular the linkages between the international, national and local scales and the obstacles to the transfer of policy instruments and norms from one region to another
- ❑ Land Use and Land Cover Change- the social dimensions of changing land use, human settlements and land cover patterns
- ❑ Valuation of Ecosystem Services- current thinking on the values that can be attributed to services such as climate regulation, water supply and recreation
- ❑ Demographic Change and the Environment- the relationships between population growth and other demographic factors, for example migration, and environmental change

Further topics include

- ❑ Industrial Transformation
- ❑ Vulnerability and Impact Assessment
- ❑ Resource, Security and Adaptation
- ❑ Climate Change and Risk Management
- ❑ Ecopolicy Linkage
- ❑ Public Perception/Attitude/Behavior
- ❑ Sustainable Development
- ❑ Urbanization
- ❑ Integrated Assessment
- ❑ Institutionalizing Science in Global Environmental Policy
- ❑ El Niño
- ❑ Carbon Management Post-Kyoto
- ❑ Innovative Social Sciences in Coastal Zone
- ❑ Environmental Management and Audit
- ❑ Business and Trade
- ❑ Health

International Scientific Planning Committee (ISPC)

Eckart Ehlers	International Human Dimensions Programme on Global Environmental Change (IHDP), Germany
Lisa J. Graumlich	The University of Arizona, USA
Jill Jäger(Co-chair)	International Human Dimensions Programme on Global Environmental Change (IHDP), Germany
Yoshinobu Kumata	Tokyo Institute of Technology/Human Dimensions Programme Committee, Science Council of Japan (SCJ)
Angela Liberatore	DG XII/D-5, Commission of the European Communities, Belgium
Yanhua Liu	State Science and Technology Commission, China
Elena Nikitina	Russian Academy of Science, Russia
Shuzo Nishioka(Co-chair)	Keio University/IGES, Japan
Rajendra K. Pachauri	Tata Energy Research Institute (TERI), India
Ronald R. Rindfuss	University of North Carolina at Chapel Hill, USA
Roberto Sanchez	University of California, Santa Cruz, USA
Youba Sokona	ENDA, Environnement et Developpement Programme Energie, Senegal

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Hideyuki Mori	Environment Agency of Japan/APN
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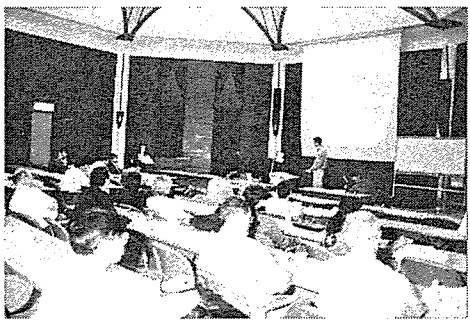
Scenes from the Open Meeting

OPENING CEREMONY

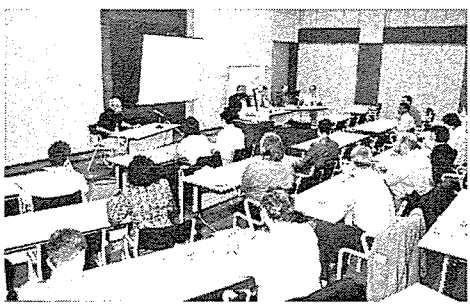
SESSION IN DAZAI-HALL

PARALLEL SESSION



SESSION IN A SMALLER ROOM

PARALLEL SESSION



PLENARY TALK

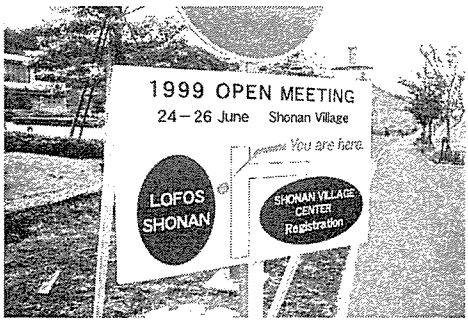
POSTER SESSION

POSTER SESSION

CLOSING SESSION

FAREWELL PARTY (opening a barrel of sake)

FAREWELL PARTY



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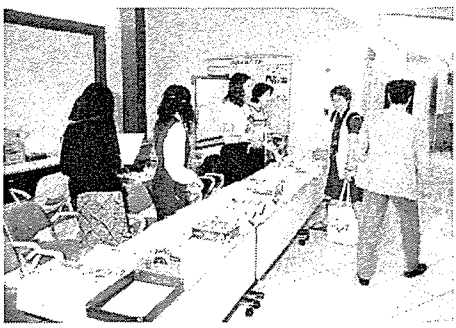
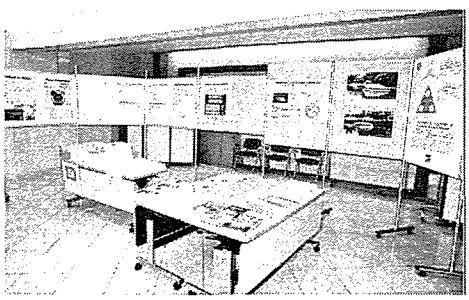
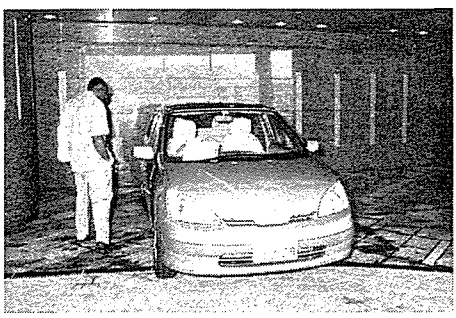


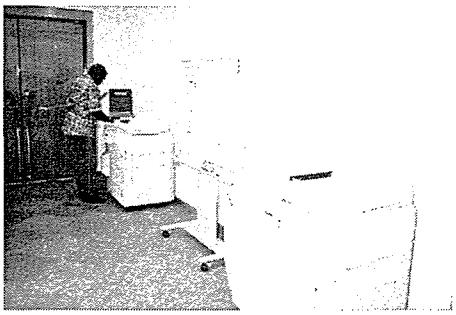


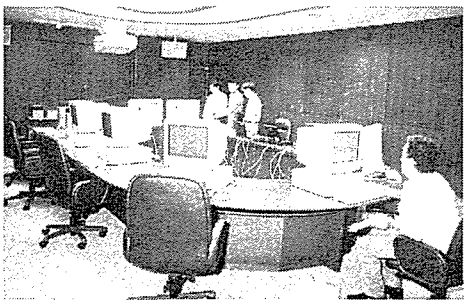
IGES INFORMATION CORNER

DISPLAY OF HYBRID CAR



FREE PHTOCOPYING SERVICE





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Preface

Preface to the Report of the third Open Meeting

Akio Morishima

Chair of the Board of Directors

Institute for Global Environmental Strategies (IGES)

On the occasion of the publication of the report of the 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community, I would once again like to express my sincere thanks on behalf of IGES to the distinguished researchers who took part in this meeting. I would also like to thank the sponsors of the meeting including the Japanese Environment Agency and the Asia Pacific Network for Global Change Research. Furthermore, I would like to pay my heartfelt respects to the members of the International Scientific Planning Committee that planned and organized the meeting, especially Dr. Jill Jäger and Dr. Shuzo Nishioka, who served as the co-chairs of the Committee and made every effort to make this Open Meeting a success. It was a great honor for IGES to be able to host this important meeting, which was the first of such meetings in Asia.

Please allow me to take this opportunity to briefly explain about our organization. We formally began activities in April of last year. IGES is quite new as a research institute, having been established under the initiative of the Japanese government. In January 1995, an idea for IGES was presented to Prime Minister Tomiichi Murayama by his Ad-Hoc Commission on Global Environment in the Twenty-First Century. It proposed the establishment of a practical international and inter-disciplinary research institute which would conduct strategic research to cope with global environmental issues, especially in the Asia-Pacific Region, from the point of view of human and social sciences, and then present its research results to policy makers. In response to this proposal, IGES was established by the Japanese government as a part of its international contribution; our establishment was acknowledged by ECO ASIA, a congress of high-level governmental officials and environmental experts in Asia. IGES is funded by the Japanese government, but we hope to become an international organization in the near future.

With more than half the world's population, Asia is in the process of rapid industrialization and so it seems inevitable that Asian countries will face serious environmental problems in the twenty-first century. IGES, being located in Japan, conducts research focusing mainly on environmental issues in Asia. In its first stage ending in March, 2001, IGES currently has six strategic research projects: Climate Change, Urban Environmental Management, Forest Conservation, Environmental Education, Environmental Governance, and New Development Patterns. In fact, research in these projects share common themes with the topics discussed in this Open Meeting. In addition to these six projects, IGES is hosting the Technical Support Unit for the Task Force on the IPCC National Greenhouse Gas Inventories.

We felt we were really fortunate to have so many researchers specializing in human dimensions of global environment visiting us just after we had started research activities. This meeting provided the researchers at IGES an opportunity to listen to top-class discussions right here at our own institute. I wish the members of human dimensions research community will continue to extend to IGES guidance and support for the future.

This report includes all Plenary Talks, invited comments, and summaries of parallel sessions that were presented at this Open Meeting. And its compilation was supervised by Dr. Jäger and Dr. Nishioka. I believe the success of this meeting was due to the hard work of all involved and my thanks go out to each and everyone. Finally, it is my hope that this report will contribute to the advancement of studies in the field of human dimensions of global environmental change research.

Three days towards "Science of the 21st Century"

Shuzo Nishioka

Co-chair

International Scientific Planning Committee (ISPC) of the 1999 Open Meeting

Professor, Keio University

Project Leader, Institute for Global Environmental Strategies (IGES)

The 1999 Open Meeting of Human Dimensions of Global Environmental Change Research Community was held on June 24 to 26, 1999 at Shonan Village Center in Japan. This report is a summary of the whole meeting, which ended successfully with the participation of more than 350 researchers from all over the world. Together with the 'Abstracts of presentations' distributed to the participants, I hope this report serves as good reference material to show the progress and direction of research in the human dimensional aspects of global change.

The rapid growth of human activities in the latter half of the twentieth century has established a social system that depends on mass production, consumption and disposal of natural resources. To support the increasing population, the land area exploited for farming and stock raising also increased rapidly, which caused changes in land use and degradation. Domestic and international conflicts over the distribution of water and the quality of ambient air, and also environmental resources such as the natural ecological system thereafter affects the stability of human society. Therefore, the establishment of a global stewardship of environmental resources is now being sought, as in the case of global warming.

These past decades, natural science has succeeded in grasping the changes in the environment, and advanced technology has endeavored to repair the damages to the environment to some extent. However, contemporary society has reached far beyond the point where its environmental soundness can be recovered by such piecemeal temporal solutions within the conventional life-style and institutions of human beings. In this sense, environmental conservation in the future must be approached from a social- and human-scientific aspect that encompasses human understanding and behavior, social customs and institutions. Various new research fields have appeared where such knowledge combined with natural science is essential, requiring the establishment of a new type of academic integration system. This new academic system will not start from mere conception, but rather from series of footprints left by individual researchers who have grappled with research and exchanged opinions, and in this way only, new systems can spring up.

The 1999 Open Meeting was devoted to discussions and exchange of opinions by individual researchers, who brought their own research output in their field. These three days were spent searching for a way to shape science in the twenty-first century, in order for the human race to overcome the dangers that it has brought onto itself. The meeting centered around five plenary talks made by invited speakers, and presentations of analysis of research results and reports of future themes from all over the world. Presentations were also made in some forty-seven of the human dimensions research community sub-sessions and a poster session. In the Closing Sessions, commentators discussed the goal and the way to reach it.

This Open Meeting was originally planned as a spontaneous bottom-up style meeting for presenting and exchanging study results and opinions of researchers from all over the world, who are interested in human dimensional aspects of global environmental change. The meeting this year is the third

one after meetings held at Duke University in USA in 1995 and at IIASA in Austria in 1997. The number of participants is increasing with each meeting, showing the growth of worldwide interests in the field.

This meeting was planned by the International Scientific Planning Committee (ISPC), consisting of scientists from different regions of the world, each with a different field of research. The ISPC discussed the framework of the meeting in March 1998, and the program was decided in December, 1998, when some 200 abstracts to be presented in the meeting were selected out of more than 500 submissions.

I believe this meeting, first of all, contributed to accelerating the momentum of human dimensional research for global change. Not only did individual research by each researcher make progress in preparing for the meeting, but also new themes were explored and many new research collaborations started among the researchers who gathered at the meeting. This third meeting had more participants from developing countries than the former two. To solve global environmental issues, it is important that all research from different regions should be collected together. From this viewpoint, the role of researchers in developing countries is essential. Thanks to the many sponsors, this meeting was quite significant in that we had a large participation of researchers from developing countries. The meeting was also successful because it pushed forward the ties between the Open Meeting and IHDP, which is an international cooperative research program jointly sponsored by ISSC and ICSU. Some of the sessions were composed of core-programs of IHDP, and many young scholars who participated in the IHDP Summer School made presentations this time.

The success of the meeting owed very much to the co-operation of the sponsors: Environment Agency of Japan, Asia-Pacific Network for Global Change, US National Science Foundation, International Human Dimensions Programme on Global Environmental Change, the John D. and Catherine T. MacArthur Foundation, and National Institute for Environmental Studies of Japan. I would especially like to thank the hosting organization, the Institute for Global Environmental Strategies, which supported the meeting with skilled staff and financial contributions. Plans are being made for the fourth meeting to be held in Brazil in 2001. I sincerely hope that this 1999 meeting was a milestone in the history of human dimension research for global change.

Opening Addresses

Jill Jäger
Co-chair
International Scientific Planning Committee
(ISPC) of the 1999 Open Meeting (Austria)

Akio Morishima
Institute for Global Environmental Strategies
(IGES) (Japan)

Hironori Hamanaka
Environment Agency, Government of Japan
Asia-Pacific Network for Global Change
Research (APN)

Jill Jäger

Co-chair

International Scientific Planning Committee (ISPC) of the 1999 Open Meeting

Executive Director

International Human Dimensions Programme on Global Environmental Change (IHDP)

Director-General Hamanaka, Professor Morishima and members of the Human Dimensions Research community, it's not only my pleasure but my honor to give the first of the opening statements at the 1999 Open Meeting of the Human Dimensions Research Community. I am doing this in my capacity as the co-Chair of the International Scientific Planning Committee, which has been working fairly continually over the last two years on the organization of the meeting.

As most of you know, this is the third meeting of this kind. The first one was held in 1995 at Duke University in the U.S.. The second one was held 1997 at IIASA in Austria. And as with the other 2 meetings, the objective of the third meeting is to continue the building and consolidation of the research community on the Human Dimensions of Global Environmental Change.

The planning committee was very encouraged, although I must admit also somewhat overwhelmed, by the fact that we received on the order of 500 abstracts submitted for this meeting. Those of you who've looked in the abstracts volume will see that we could only accept less than 200, which meant that we had to turn away more people/more abstracts than we accepted. So the selection was hard. We did as good a job as we could based on the high scientific quality of the abstracts that were submitted with some considerations every once in a while on geographical and gender balance. The agenda of the meeting also reflects an increase in the number of disciplines and the number of the countries that are represented at the meeting. The high quality set of abstracts that we received and the large number is a really good sign of the growing strength of the Human Dimensions Research Community and I think it will be a challenge for all of us during next 3 days to decide which of the 7 or 8 parallel sessions we want to go to each time.

We would not be gathered in this beautiful location, however, without the hard work of a lot of people, enormous commitment and a lot of inspiration as well. If I started to list all of the individuals, I think it would take me far more than the time that I was allotted this morning. But I do want to start by thanking a few people personally: my co-Chair, Shuzo Nishioka, with whom I really have had the pleasure of organizing the meeting, all of the members International Scientific Planning Committee and their names are listed in the program, helped us at all stages of the planning of the meeting and really worked as a great team with the two us especially when we had the hard task in December of selecting from the abstracts. We worked I think as a very forward looking team and that contributed enormously to this process of organizing the meeting.

However, without our host organization, IGES, even the best planning committee would have been lost. We owe a tremendous amount of gratitude and admiration to IGES, to the staff that have acted as the Secretariat. They have been enormously helpful over the past year and indeed in the whole time in planning for the meeting.

I have to acknowledge the sponsors of the meeting, again all listed in the program -- the Environment Agency of Japan, IGES, the Asia-Pacific Network for Global Change Research, IHDP, the U.S. National Science Foundation, the Inter-American Institute for Global Change Research, the John D. and Catherine T. MacArthur Foundation and the Center for Global Environmental Research in Japan. I acknowledge very gratefully the work of the local Organizing Committee -- to get everybody here and have a meeting in this location was a lot of their work.

And finally I want to thank my new colleagues at IHDP for their patience especially in the last two

months when I have been absorbed in the preparation of the meeting.

The Planning Committee want me to thank very heartily the plenary speakers and the commentators for their work in the preparation of the meeting and, in particular, to thank Professor Zhao Shidong who has stepped in as a commentator at very short notice.

I have to point out that there will be inevitable changes in the agenda -- last minute changes. Major changes on the agenda will be posted on the big notice boards in the entrance halls of the Shonan Village Center and here. The major change that I want to point out right now is that there will be no evening sessions on programs and networks on Friday evening. You are perfectly welcome, as it says in the program, to organize informal meetings in rooms available and you can contact the Secretariat to organize such events.

I will close by welcoming all of the you to the 1999 Open Meeting. I hope the next 3 days will be inspiring and enjoyable. I hope that during the course those 3 days that you might give some thought to a possible venue and time for the next open meeting. And if you have any ideas, please discuss them with any of the members of the International Planning Committee, so that when we meet again at the end of this meeting we can compile some of your ideas and think how we go forward from this meeting. Thank you.

Akio Morishima

Chair of the Board of Directors

Institute for Global Environmental Strategies (IGES)

Good morning distinguished scholars and ladies and gentleman. On behalf of the Local Organizing Committee and IGES, I would like to express my heart-felt welcome to the participants of this very important meeting, the 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community. The International Scientific Planning Committee of the 1999 Open Meeting has been working very hard and I was particularly impressed last December when they got together and worked from early morning till very late. I think it lasted 2 or 3 days and I was an observer. They were working very hard to select the papers that will be presented at this meeting. Without their efforts, I do not believe that this gathering would have been possible.

Taking this opportunity, may I be allowed to spread propaganda about IGES? IGES was only established in April of last year on the initiative of the Japanese government. Our aim is to explore what we call innovative policy instruments and strategies to realize sustainable change and sustainable society. I was very pleased that the IHDP and you have the same common interests as IGES. We are very motivated to cooperate with you and I hope we can expect your help in developing our institute. For the first stage, we have 5 projects: Climate Change, Urban Environmental Management, Forest Conservation, Environmental Education and Environmental Governance. At present we also have two different areas of business at the planning stage. One is the planning of a research project for New Development Patterns. The main target area of our institute is Asia and the Pacific, and we are exploring what kind of way of life can be applicable to the Asian region. This project is very ambitious and we are very carefully developing new projects. We also plan to initiate a training program for policy makers and government officials, NGOs and researchers. Of course, it will need much funding so we must seek new funds to carry out these training programs. In any case, we are a very new institute. We need help from outside Japan and Asia and we are very much looking forward to cooperating with you.

Lastly, I would like to express our gratitude to the sponsoring agencies: the Environment Agency of Japan and the Asia-Pacific Network for Global Change Research. For this meeting, many foundations and governmental agencies have also provided us with funds to invite researchers from developing countries. So again I would like to thank all of you and all of the organizations supporting this important meeting. Thank you very much.

Hironori Hamanaka

Director General

Global Environmental Department, Environment Agency, Government of Japan

Chairman

Inter-Governmental Meeting

Asia-Pacific Network for Global Change Research (APN)

Thank you very much Dr. Nishioka for the kind introduction. Professor Morishima, Dr. Jill Jäger, distinguished participants, ladies and gentlemen, it is a great honor for me to be invited here and to say a few words on behalf of the Environment Agency of Japan and as the Chair of the Intergovernmental Meeting of the APN. First of all, I would like to take this opportunity to express my heartfelt appreciation to Dr. Jill Jäger, Professor Nishioka and the other staff of IGES and everyone who has been working very hard to have this meeting here at Shonan Village.

With the attendance of many leading experts from around the world, I have high expectations that this meeting will produce significant results and make great contributions to our understanding of global environmental issues. As we all know, global environmental change has profound impacts on the very foundations of human existence, and the international community must take urgent actions to deal with these issues, especially climate change, which is one of the biggest challenges facing the human society. As an industrialized country and as one of the largest emitters of greenhouse gases, Japan has started to take significant domestic action. In June 1998, a task force of cabinet ministers to address global warming adopted the guidelines for measures to prevent global warming, based upon which a broad range of measures has already been introduced. Firstly, the law for promotion of measures to address global warming was enacted last fall and became fully effective in April this year. This new law provides legal foundation for promoting action to be taken by the national and local governments, industry and cities. I believe this is the first legislation of its kind in the world.

Secondly the law concerning rational use of energy was amended last year and energy efficiency standards for automobiles and electrical appliances have been significantly strengthened with the aim of meeting or exceeding the highest energy efficiency levels that have been achieved so far. One of the key elements of government action in the protection of the environment is the promotion of environmental research. This is because of the belief that science and technology can play an important role in laying the foundation upon which appropriate policies and measures are crafted. Obviously, international cooperation is a must when it comes to research on global environmental change. The support of the 1999 Open Meeting is one of our efforts in that context. The Asia-Pacific Network for Global Change Research or APN is an inter-governmental network within the Asia-Pacific region and was established to promote global environmental research activities in the region. At the 4th APN inter-governmental meeting held in March this year in Kobe, Japan, the APN made unanimous decision to support the 1999 Open Meeting as one of the most important meetings to facilitate global environmental studies.

Now, there seems to be a great shift of focus in global environmental research. The international community has placed emphasis on research aiming at a deeper understanding of mechanisms of global environmental change. Now the focus seems to be providing a basis for developing policy options to address issues arising from global environmental change. This shift may have been triggered both by growing demand from policy-makers and by recent developments in scientific research. In fact, the IGBP congress held here about a month ago stressed the importance of integration of natural and social science.

There are 5 main themes of this meeting. One of them is land use and land cover change. This is a central topic of current international debate and has become critical in the international regime for addressing climate change. Another theme, conflict and the environment, has been a major agenda for international consideration and cooperation. As exemplified by these, it can be said that the focus of this meeting is very much in line with the current issues with which human society in confronted. This is the 3rd Open Meeting following the two successful meetings held in 1995 and 1997. The need for the integration of natural and social science is becoming much more important. This meeting may be able to provide us with a timely opportunity for using scientific findings for the development of action to address global environmental issues.

This is the first open meeting held in Asia. Asia is a region where environmental challenges are of the most serious in the world and environmental situations could be further aggravated as economies and populations in the region continue to grow and expand. Being held in Asia, there is hope that this meeting will help to activate global environmental research activities and raise environmental awareness among politicians, the business community, the press and people in other sectors in the region.

Lastly, I would like to close my remarks by expressing my sincere hope that this meeting can live up to the expectations of the international community and become a useful step for further promotion of the Human Dimensions of Global Environmental Change. Thank you very much.

Plenary Talks

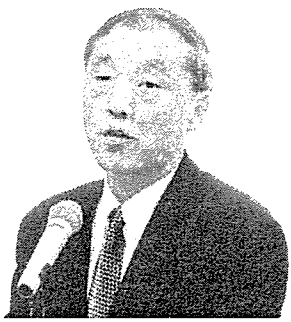
A Plenary Talk was given in all sessions except in Session 4. Each Plenary Session consisted of a keynote speech on one of the major themes of the meeting, made by a leading scholar of the field, followed by a prepared commentary. The themes of the Plenary Sessions were: 1. Land Use and Land Cover Change; 2. Demographic Change and the Environment; 3. Decision-making Processes in Response to Global Environmental Change; 4. Conflict and the Environment; and 5. Valuation of Ecosystem Services.

Plenary Talks

Session 1

Chair: Lisa Graumlich
(a member of ISPC of the 1999 Open Meeting)
The University of Arizona (USA)

Speaker: Diana Liverman
Latin American Area Center,
the University of Arizona (USA)



Commentator: Shidong Zhao
Commission for Integrated Survey of Natural Resources, Chinese Academy of Sciences
(People's Republic of China)

Land Use and Land Cover Change

Diana Liverman

Director, Latin American Area Center, University of Arizona
103 Douglass Building, Tsuson AZ 85721, USA

I'm going to be the guinea pig for the use of computers by the other participants - some of you may change your mind about using a computer after I make my mistakes.

It is a great honor to talk in this first plenary session. I would like to begin on behalf of all of the participants by thanking the organizers, by thanking our Japanese hosts at IGES and by thanking IHDP and all of the sponsoring organizations. It takes a tremendous effort to bring people together from all over the world. I overheard Jill saying, "it is not a theory anymore, they are really here", as everybody walked in to the room. I am sure for the organizers it really does seem like a miracle that we are all here and ready to present our papers.

I also want to take this opportunity to congratulate everybody in the International Human Dimensions Community for the very great progress that we have made over the last decade. I have been involved nationally and internationally in helping to develop the human dimensions community and to foster social science research on global change. I do think this meeting marks a real maturing of the research community.

We can see that maturing through a number of successes and through a number of measures of progress. We have got several very large international collaborations that have occurred over the last decade. For example, we have greatly expanded the study of climate impacts through the participation of social scientists in the IPCC. Several large collaborative projects have looked at international environmental policies, producing very interesting results and that are now informing the policy community. There are also a number of exciting collaborative research projects, some of which I am going to mention, that are looking at land use change.

Another measure of the success and progress of this community is the large number of national and international organizations and committees that are now looking at human dimensions research. Yesterday afternoon I attended a meeting, organized by the IHDP, of representatives of the national human dimensions committee. And it was really great to see all of the different people and all of the different countries that now have activities relating to human dimensions research. Ten years ago, maybe only two or three countries had a formal commitment to this research area. I am particularly pleased to see APN, IAI and START fostering the participation of people from the south in human dimensions research, and its great to see so many representatives, particularly from Africa and Latin America, being able to participate in this meeting in Asia.

We also see several benchmark volumes that are now being produced, as well as reports and new research agendas. It was interesting to see that both the U.S. and Swedish human dimensions committees have now put out "What are we going to do next" reports, reflecting on the last decade of research.

I also believe that there's more money around today for human dimensions research but I will continue to argue that its inadequate compared to what our earth science colleagues are getting. That is one of our big battles, to convince our earth science colleagues that our field covers at least half if not more than half of the important global change questions and thus, we should be getting

a larger portion of the funding pie.

One measure of our success is that many of our colleagues in the earth and biological sciences now have a greater respect for what we can do, they acknowledge the value and significance of social science work, and they are actually starting to solicit our collaborations. In the U.S. there are now many requests for proposals where if you do not have social science and human dimensions on your team and you are a group of earth scientists, you are not going to get funded.

I do think that we have a long way to go as human dimensions researchers. Certainly, humans are continuing to transform the global environment in ways that we know have impact on climate, on biodiversity and on biogeochemical cycles. However, we face enormous challenges in monitoring, understanding, modeling, predicting and perhaps most importantly, managing the human relationship to the global environment.

Even though we have caught the attention of our colleagues in the earth sciences, there is still a lot of skepticism out there, both from the physical scientists, from the stakeholders and from the policy makers. They are sometimes skeptical about our theories, our methods and our policy recommendations. I have certainly had my fair share of comments that the qualitative research we do is not scientific, or it is anecdotal. We still have to convince some that we should be taken seriously.

As Lisa mentioned, the organizing committee has asked me to review one area of human dimensions research, that of land use and land cover change. My objectives are to assess some of the progress in understanding land use change and examine what I feel are some of the main challenges and research opportunities. I am going to illustrate some of those points with examples from my own research and from some of my colleagues and student's research from Mexico.

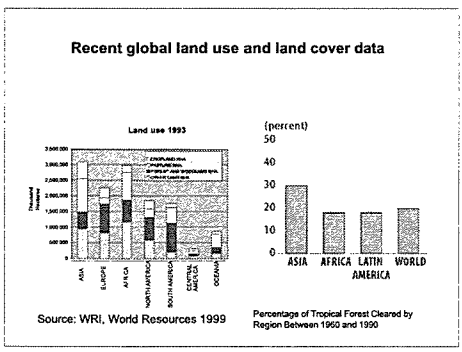


Figure 1

As we approach the millennium, the amount, the rate and the intensity of land use and land cover change remains high. The human impact upon the land is still very great and increasing. These graphs (Figure 1) show a couple of sets of data that have just been put out by the World Resources Institute as a recent assessment of the status of human impact on the land and rates of land cover change. They show large areas of domesticated land in most regions of the world and also very high deforestation rates over the last 30 years, 20% to 30% in much of the developing world. I should note that the WRI uses FAO data from governments and many people feel that these are underestimates.

Now I would like to discuss the place where I do most of my research - Mexico (Figure 2). Mexico has had very high deforestation rates in the last few decades, associated with increases in pasture/ crop and urban areas. It also illustrates very high rates of land use intensification associated with the use of agricultural chemicals and the increasing use of irrigation. Just to show a few examples of this, satellite data show up to a 50% loss of forest since 1970 (Figure 3). They also show an increase of pasture of 10%, a doubling of the seeded pasture area, and expansion of cropland by 8%. If we look at the FAO data on intensification of land use in Mexico, it shows an increase in chemical fertilizer use from 20 to 70 kilograms per hectare over the period since 1970 and also a doubling of the irrigated area from 1961 to 1997 (Figure 4). These types of changes in land use, land cover and intensification of the use of land have dramatically increased Mexico's greenhouse gas emissions, as well as changing the regional climate. It's created great vulnerability to hurricanes

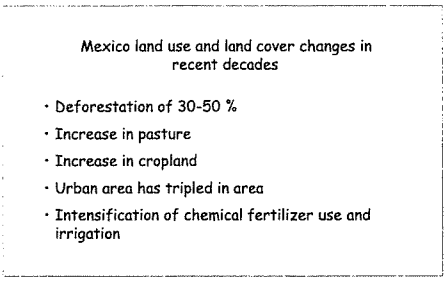


Figure 2

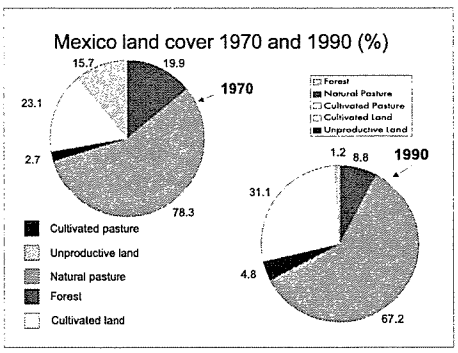


Figure 3

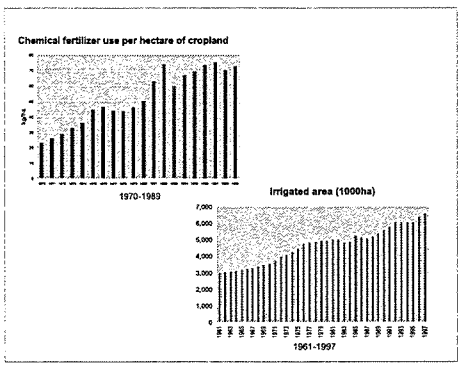


Figure 4

and fires and has threatened the overall sustainability of people's livelihoods in Mexico.

Globally these changes have prompted scholars to develop and coordinate programs to monitor, understand and model land use and land cover dynamics. The type of data that I have shown you from Mexico will be paralleled in many of the other talks at this meeting because many parts of the world have seen similar changes.

In the case of land use and land cover research, we have seen a lot of progress in the last decade (Figure 5). One of the things that is a measure of progress is that land use and land cover change are now at the core of the global change research agenda in many countries. Just in the last few years, the U.S. Global Change Research Program has identified land use and land cover change as an important research area. As we will see in a minute, the International Human Dimensions Programme (IHDP) and the International Geosphere/Biosphere Program (IGBP) also see land use as a very important focus for their research. Within these research programs, social science has been granted an important role. In the U.S. where I work one indication of that was the decision of NASA to fund social scientists through the NASA budget.

Another area where we have seen a lot of progress is in the use of technologies such as geographic information systems and remote sensing by social scientists. And it is not just social scientists, we are starting to see stake holders, non governmental organizations and conservation groups starting to use GIS and remote sensing to manage land use. We have used these technologies to differentiate socially and ecologically significant processes. We are not just to looking at the processes that the earth scientists are interested in but are also looking for social information and to integrate social information using those technologies, looking at secondary growth for example.

Another area where we have made progress is to move beyond the simple IPAT analyses (Environmental Impact = f(Population, Affluence and Technology)). We have moved beyond simple interpretations of population impact on the environment to much more complex analyses, including the role of culture and particularly the drivers associated with institutions that are extremely important in understanding land use and land cover change.

Finally, I would say that the organization of international collaborative and comparative projects such as the land use and land cover change initiative of IHDP and IGBP are also a good measure of

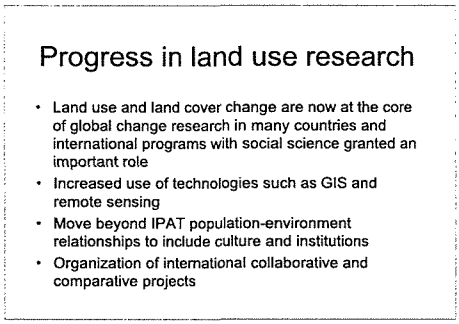


Figure 5

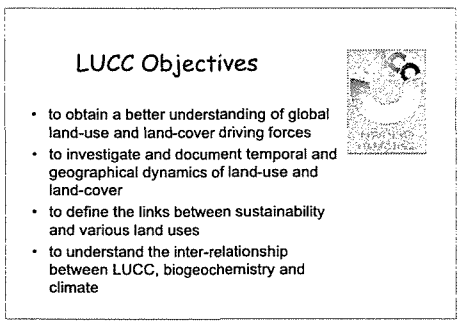


Figure 6

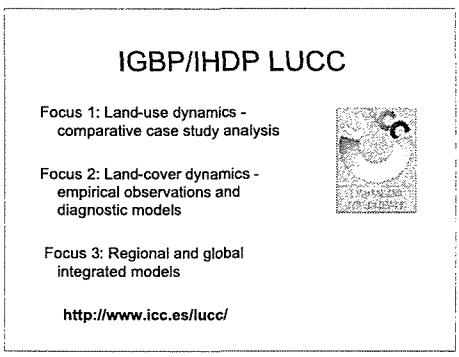


Figure 7

progress. If we look at the international LUCC (Land Use Land Cover) initiative, it now has science and implementation plans, core project offices and many affiliated projects.

Since this is the only opportunity to introduce the IHDP/IGBP LUCC program to the audience as a whole, I am going to take a minute or two to describe it. I know many of you are familiar with it, but for those of you who are not, I would just like to talk a little bit about this big international initiative. Because like this meeting, which is an open meeting, the LUCC initiative is an open initiative and you are all invited to participate and join in this international effort.

The objectives of LUCC are to obtain a better understanding of global land use and land cover driving forces; to examine temporal and geographical dynamics of land use and land cover; and to define the links between sustainability and various land uses (Figure 6). It is also interested in understanding the inter-relationship between land use and land cover change and biogeochemistry and climate. This is one of the most important ways in which we link to the overall global change agenda and that of the earth sciences.

The IGBP/IHDP LUCC program has three main focus areas and these are all described on the home page of the LUCC core office in Barcelona, found at http://www.icc.es/lucc/ (Figure 7). Those of you who are interested and want to find out more about it, Xavier Baulies is here from the LUCC core office and he would be happy to give you more information. One of the things he has brought with him is the new implementation plan, which describes how this international research project is going to go forward.

As I mentioned, there are three main focus areas. The first main focus is land-use dynamics and this involves a comparative case study approach to understand the dynamics of land management. Focus One sets out to identify and analyze a series of regional situations that represent the major clusters of land-use and land-cover dynamics worldwide. The goal here is to improve models and also contribute to some local research on climate, for example, or sustainability.

The second focus is land cover dynamics. The second focus conducts regional assessment of land cover change using direct observations including both fieldwork and remote sensing using satellite imagery. It also links these to models. The goal here is to provide spatial specificity in the land cover outcomes associated with the management of particular land uses. So Focus One uses more comparative case studies, involving perhaps more qualitative work, whereas Focus Two really takes

advantage of the new technologies of remote sensing, combining them with field studies to put together a set of observations.

The third focus is the one that examines modeling - both regional and global modeling. The goal here is to improve existing models and to build new ones to project land use changes from the underlying driving forces, such as institutions and population. The most important thing when we are doing this is to ensure that the models are regionally and spatially explicit.

I know that those people involved in the international LUCC initiative would like me to encourage many more social scientists to become part of the LUCC effort and to benefit from the collaboration and organization that is already in place. It's an open process, and one of the things that you can do through the LUCC web page is to submit your own project for approval or for incorporation into the international LUCC initiative and you can also volunteer to participate in initiatives. This is an open process and Billie Lee Turner and Eric Lambin amongst others encouraged me to tell everybody that they really do want your participation.

I do not believe that the LUCC implementation plan is perfect or that we have an easy job as we go to the next decade of land use and land cover research. Therefore what I want to do for the rest of my talk is to highlight some of the challenges that I think we face in land use and land cover research. Many of these I am actually pleased to say are going to be addressed in sessions at this conference, and I am looking forward to attending those and seeing how some of you are meeting those challenges.

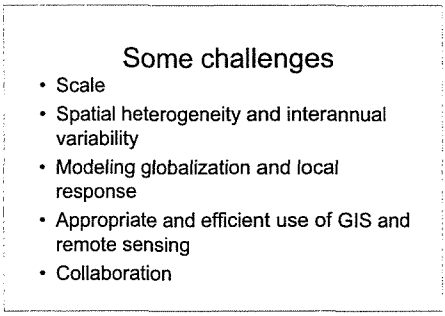


Figure 8

The way that I identified these challenges was to reflect back on my work over the last 5 years and actually look at some of the roadblocks I have encountered and some of the things that I am not quite sure how to handle in my work in Mexico. I have listed just a few of them on Figure 8.

The first challenge is from the perspective of a geographer and is the issue of scale and how to handle it. A second one I'll mention is spatial heterogeneity and inter-annual variability, something that we faced a lot in the last couple of years in Mexico. I will briefly touch on the subject of globalization and if I have time I will talk about the appropriate and efficient use of geographic information systems and remote sensing and also the challenges of collaboration.

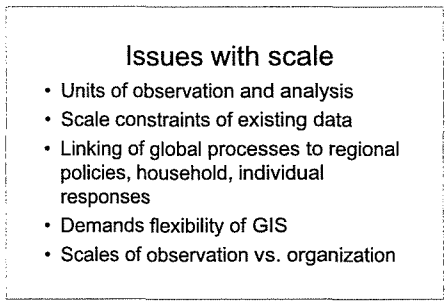


Figure 9

Let me start by talking about some of the issues we face in working with scale (Figure 9). Scale dominates so much of the work that we do trying to understand land use and land cover change worldwide. We have got big challenges in deciding at what scale to collect original data. These include decisions about whether we are going to work with individuals or households and how can we scale up and collect data at larger scales in order to provide a more global overview. Most of us are also working with existing data, so we are faced with the constraints of existing census data or the historical satellite images. So the scale constraints of the existing data are a big challenge and how can we transpose that existing data to the scales where we are trying to do our analyses.

We also have problems with the scale at which different processes are operating. We have got to try to link the scales of global processes to regional policies and even to households and individual responses. As I will try to show, even individual decisions can be extremely important in regional and global land use and land cover change. Another thing about scale is that it really demands flexibility from our geographic information systems. You can build this really great GIS and then another piece of data comes in at a different scale and you really have to go through big transformations to reconfigure your geographic information systems to deal with this new data at a new scale.

Another problem is the fuzziness of some of the data and this is an enormous challenge when you have a geographic information system that demands absolute boundaries and you are dealing with qualitative or migratory issues where the boundaries are not to easy to fix.

One point that the LUCC implementation plan mentions is the need to distinguish carefully between scales when dealing with human activity. We sometimes get confused between the scale of observation, which is the spatial units at which the data is being collected, and scales of organization, which are the administrative units at which data is being collected and decisions are made.

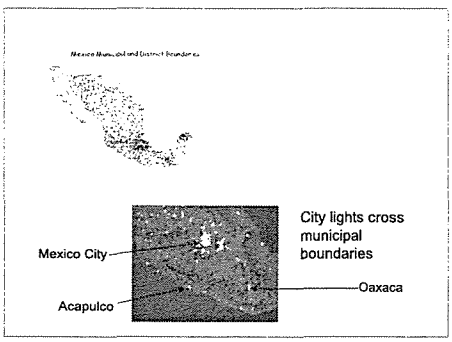


Figure 10

Now let me illustrate some of the problems that we have had in our Mexico research with scale. The first one is the large number and varied size of with administrative units (Figure 10). Working with census data by itself has its own problems, in Mexico we have got 2,500 municipalities where we have some data on land use and driving forces, for example from the population census. In this case even the varying size leads to all sorts of statistical problems when you are trying to do statistical analyses. For example you can have ecological fallacies and other problems when some areas have very large municipalities and some have very small ones.

A second problem is illustrated by a city lights image and that is that many of the most important human marks on the landscape, cities or very intensive human use areas, straddle the municipal boundaries that include most of our data. For example, Mexico City has spread into many of the surrounding municipalities and if you're trying to do statistical analyses or model what's going on, its very hard to make decisions about allocating demographic data. CIESIN has helped by providing a geo-referenced population set but they have not referenced a lot of the other data that you need in order to analyze the driving forces for land use change.

Correlation of drivers with land cover change at different scales

Correlation with forest loss 1980-90				
	State	Municipio	40000km	2500km2
Percent irrigated cropland	-0.15	-0.05	-0.08	-0.07
Percent ejido	-0.03	-0.015	0.02	-0.028
Protected area	0.21	0.06	0.17	0.02
Population growth	-0.01	0.08	-0.03	0.05
Growth in livestock herd	0.24	0.15	0.31	0.12
Population below minimum wage	0.11	-0.05	-0.04	-0.02
Credit availability	-0.65	-0.08	-0.042	-0.07

Figure 11

Another issue that we face is one also looked at by Veldkamp and Crespo in Costa Rica, where you find the empirical relationships between drivers of land use change and land cover change vary according to the scale of analysis. What we found is that correlation between driving forces such as population growth or various economic measures changed depending upon the scale at which they were viewed (Figure 11). The correlation between these driving forces and rates of deforestation changed in magnitude, or, of even greater concern,

sometimes changed in the direction of the relationship, as you move from one spatial grid scale to another and from one administrative level to the other.

So for example, you see a stronger correlation between deforestation in protected areas or deforestation and livestock numbers at a larger scale than you do at a more local scale. The correlation with population switches from a weak negative at larger scales to a weak positive at local levels. This illustrates some of the things that happen when you start to look at what scale changes do to your analyses.

Field studies show other locally important drivers not picked up by the scale or periodicity of census or other official data. For example, one of the important drivers that we identified was that remittances from migrant workers have been invested in land conversion in Michoacan and Sonora. That is just not picked up at all in the census data we were able to collect. Another example is the use of refugees in southern Mexico as cheap labor in forest clearance in Chiapas, also not be picked up in any of the census data at the municipal level.

Another thing we have to remember about scale is that it is not a sort of a fixed or objective factor. Scale is culturally constructed by a legacy of political boundaries, by institutional organization and by ways in which we classify aggregate social phenomenon. I think that we have to be very aware of that when we are using data collected by governments and other organizations. To give you one example, the state of Oaxaca has more than 20% of all the municipalities in Mexico even though there are 31 states (Figure 12). The reason for the large amount is a legacy of a combination of indigenous and colonial overlays of power and of local organization. That allows us to do some very fine scale analysis in the case of Oaxaca but really makes it hard to compare to other states in Mexico which might only have a dozen municipalities because they have had a different historical legacy that constructed scale in a different way.

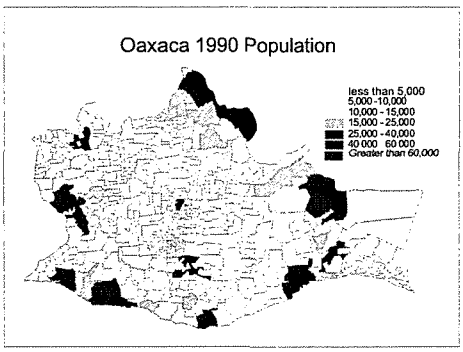


Figure 12

LUCC notes the importance of scale in its implementation plan, particularly when looking at the different scales at which processes are operating and the different scales at which institutions are operating. The plan says that we need to capture the scale dynamic, but it does not really tell us how we are going to do this.

Let me now move to the second challenge, which is to capture and understand temporal and spatial variability in land use and land cover change. Here the main point I want to make is that as much as we try to do it differently, many of the studies we read in that search for predictability tend to focus on larger scale regional trends rather than local and inter-annual variations. The LUCC implementation plan recognizes the need to acknowledge spatial heterogeneity not only in society and culture but in commodities and physical landscapes and to include that in our modeling efforts. So far I do not think that we

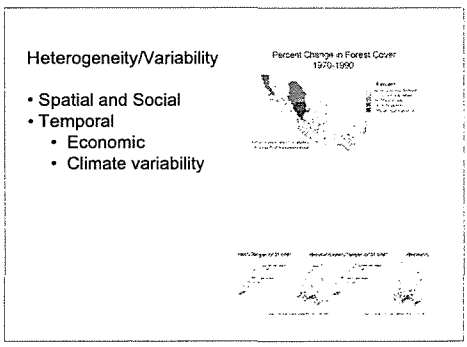


Figure 13

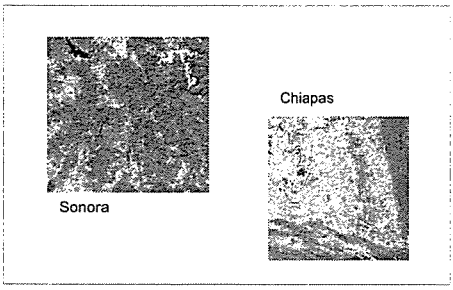


Figure 14

have done a very good job of it.

In Mexico you can see the importance of local heterogeneity, where state forest levels changes hide a tremendous local variation (Figure 13). This spatial variation results from local responses to larger scale economic and institutional changes in markets and land tenure. But once you go down to the more detailed scale, all of those larger scale regional patterns that are often used in literature to describe deforestation in Mexico become totally fragmented. In fieldwork that we have done and in satellite imagery that we have looked at in southern Sonora and Chiapas, the heterogeneity is very evident both in the satellite images (Figure 14) and even more so when we go to local communities. When you go to the field you find mixed forest/pasture or mixed forest/crop areas that just do not get picked up on the satellite images. You find people growing vegetables in little hidden areas along streams. You find that different causes produce the same land use and the same cause produces different land uses. For example, in the work we have done in Sonora, we find people converting to buffle grass for cattle which has very important biochemical and ecological implications, but is just not being picked up in the larger scale data. The people are doing this in response to both the global market and the local cultural preferences for cattle.

One of the reasons that the use of satellite imagery has been a great challenge for us in Mexico is because Mexico has great inter-annual climate variability. This can change vegetation cover and our classification of land use dramatically from one year to another, however sophisticated we try to make our analysis of the satellite imagery.

I did a lot of work on land use in Mexico in the early 1990s and I tried to make projections of what the change would be over the next decade. But inter-annual variability in both climate and economic policy has confounded any attempt to be able to model or predict land use and land cover trajectories in Mexico in the 1990s. I just want to give you a couple of examples on how our ability to model and predict has really been challenged using the example of Mexico.

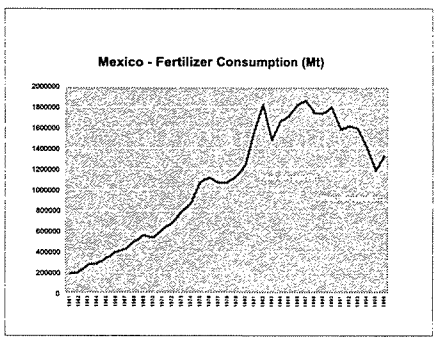


Figure 15

The first variation that has confounded us is the set of economic shocks in Mexico since 1990 that have had tremendous impact on land use and land cover. One example is the devaluation of the peso. We have two periods, one in the early 80s and several periods of currency devaluation in the 1990s. If we take the case of land use intensity, what we see as a result of these economic shocks, is dramatic decreases in fertilizer consumption as people can no longer afford to purchase either domestic or imported fertilizer (Figure 15) changing the intensity of land use in unforeseeable ways. You also see quite sudden changes in forest exploitation in certain regions where as a result of the devaluation, people are poaching or cutting wood just to try and make a little a little more money to pay off their debts.

Another major change in Mexico is the change in the land reform laws that occurred quite suddenly at the beginning of the 1990s. They ended land redistribution, and the half of Mexican land that was held collectively in ejidos is now available for sale, mortgage or rental. This has not been permitted for many decades, since the beginning of the century. So this large area of land that was in some ways protected has now been opened to the global market. Right now there is no

consensus on the land use and land cover implementations of this massive agrarian reform. However, the work that we have done in the field in local areas suggests that the better land is being used more intensively now. Also there have been quite dramatic shifts to greater land use intensity under rental or under contracts or when people have used the title to the land as a way to get credit - that means they are mortgaging their land against inputs. Another thing that is happened is that people are returning to use land that had been pretty much abandoned previously, in order to secure their land titles so that they can then sell it. Therefore in Sonora we have seen an increase in the area under agriculture in some places and the intensity of its use as a result of this land reform.

The impacts of the North American Free Trade Agreement that also occurred quite suddenly in the 1990s as well as changes in the world market for crops associated with neoliberal policies of the Mexican government have also had big land use implications that were somewhat unpredictable. One thing that has happened is that exposure to the dynamics of the open market has caused changes. Also the very unpredictable attempts by the government to buffer farmers once they start to see what trouble they are in, have caused even more changes. There have been these quick rapid shifts in policy by the Mexican government offering supports and subsidies here and there. This has created a very uncertain economic environment for farmers and has produced quite dramatic shifts from one year to another and from place to place in both the area under crops and in the type of crops that are being grown.

This graph (Figure 16) is just from one municipality in southern Sonora and you can see from 1990 to 1995, big shifts in the area planted which is partly a response to subsidies and the world market prices for different crops. You can also see changes, including a drop in the corn area as subsidies were withdrawn, then corn expands again as the government realizes that people are not making a living farming, so they need more subsidy. There is growth in the area under sesame because the Japanese came in and offered contracts for sesame production in Sonora. We also see big fluctuations in the area under beans, as there was a slight shift *in the relative subsidy for beans versus corn.*

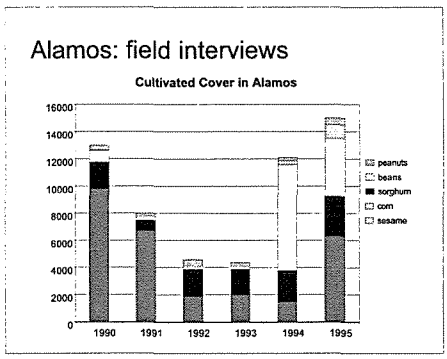


Figure 16

Another point shown by this graph is that there is an overall change in area, particularly a drop in 1992-93 that is not just related to economic shocks, it is related to climate variability. That is the next example I want to give you is the way in which climate variability has had a very large effect upon land use and land cover in the 1990s that again confounded many of our attempts to demonstrate any predictability in Mexican land use trends. Any assumptions about land cover use transition probabilities based on trends in the 1980s or in relation to driving forces, really has been invalidated by climate variability in the 1990s in Mexico. I am going to give you two examples, one is drought, the other is hurricanes and their relation to fire.

Figure 17 shows Mexican reservoir capacity in the 1990s in northern Mexico. The main point I want to show you is that in each of these reservoirs there was a dramatic drop in water availability. This

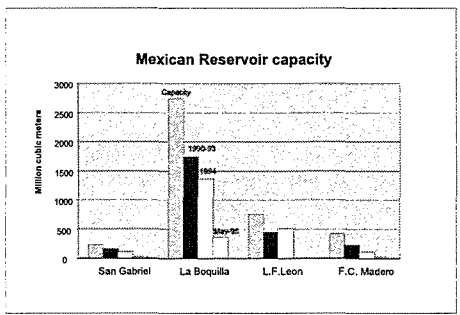


Figure 17

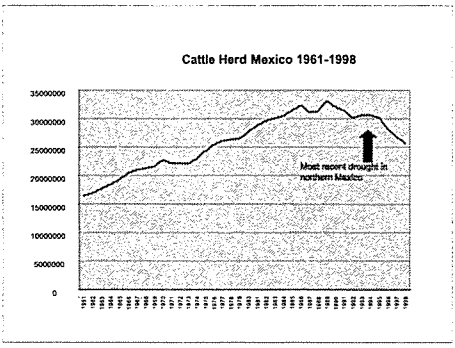


Figure 18

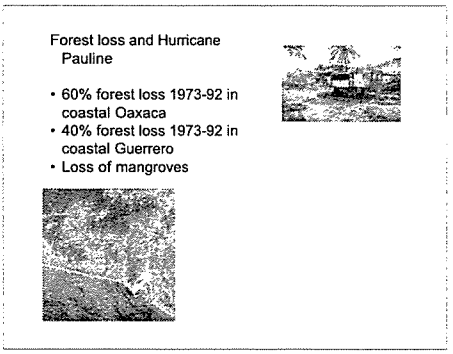


Figure 19

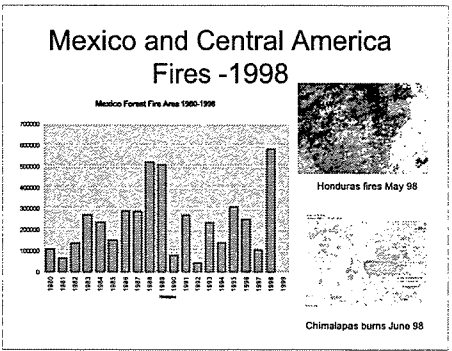


Figure 20

meant sudden declines in crop areas in the north. Secondly Figure 18 shows a decline in the livestock herd in the long-term drought season onset in the 1990's. Certainly there were changes in the market for livestock but much of the herd has been sold off. For example in Sonora, we believe that half of the herd numbers were sold off as a result of drought. This is of course has big land use and land cover implications that were perhaps not very predictable.

The second example is the severe hurricanes that hit Mexico and Central America in the 1990s and destroyed thousands of hectares of forests and cropland. We have done some work on Hurricane Pauline in Oaxaca (Figure 19). The first point I want to make is the way in which our land use analysis of deforestation showed why the impacts of the hurricane were so severe. In the twenty years prior to Pauline, up to 60% of the forests had been cut in the coastal mountains of Oaxaca on the Pacific coast of Mexico as well as in Guerrero, a neighboring state. This figure shows the location of Acapulco on the pacific coast of Mexico where many people lost their lives during the hurricane. There had also been a great loss of the mangroves in the years prior to the hurricane. All of this vegetation loss meant that the impacts of the hurricane were more severe than they would have been without land use change, because deforestation caused more flooding and landslides.

Hurricanes like Pauline hit, cause a lot of damage, a lot of forests were destroyed, and then subsequent droughts make those forests tinder dry. Then what we see in 1998 is that as people set fires to clear pastures and fertilize fields, many of these fires spread out of control with all of the dead wood and the dry climate throughout Mexico and Central America. I do not want to blame the small producers, there is also evidence that drug producers and land developers also set these fires. Figure 20 shows fires burning in Honduras last May, the lower map is of an area called Chimalapas which is one of Mexico's most valued ecosystems that was heavily burnt. What you can also see in the graph that shows the area of Mexico burnt over the last 18 or so years is that in 1998, 600,000 hectares of forest was destroyed. If we look at data from central America, hundreds of thousands of hectares were destroyed there (Figure 21). This is a massive land cover conversion that would have been very difficult to project at the beginning of the 1990s.

One of the problems is that although both international institutions, international aid and

governments in the region have promised to reforest these areas and to make sure that they are not converted to other land uses, the enforcement of these policies is very difficult. There is evidence in Mexico that the burnt areas are being converted to pasture and other land uses. The main point I want to make here is the difficult challenge of inter-annual and variability from one year to another that is evident when you see these very dramatic land use and land cover changes. In Mexico the combination of economics and climate variability poses a great challenge to our ability to model and predict land use and land cover dynamics.

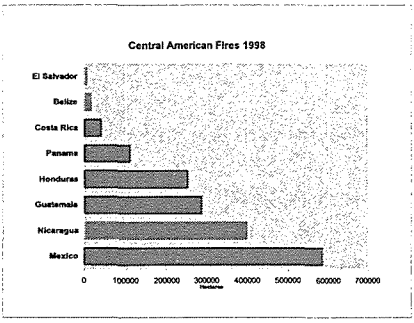


Figure 21

I am going to skip through my last challenges very quickly because I am running out of time.

The third challenge that I mentioned was the ways in which as social scientists we are using remote sensing and GIS (Figure 22). This is very much based on my own experience, and is that social scientists have tended to use GIS and remote sensing in inefficient or unbalanced ways. We spend enormous amounts of time or resources learning to become experts ourselves rather than collaborating with others. Some of us have the sense to collaborate with the experts rather than so do it ourselves, but many of my graduate students who are social scientists and are attracted to using remote sensing, have invested a too large portion of time on it to the detriment of other aspects. Some have spent more time getting one image for their masters thesis than they do on all the field work and writing up for social science combined. So I think that we need to be very careful in the use of GIS and remote sensing so that we are not just using them to produce a pretty picture for our article, but we are actually using them to ask real in depth questions. These systems *are certainly allowing us to answer questions that we could not otherwise have done so.* Even so, change detection probably is not enough, we need to socialize our classifications, we need to make links to social processes.

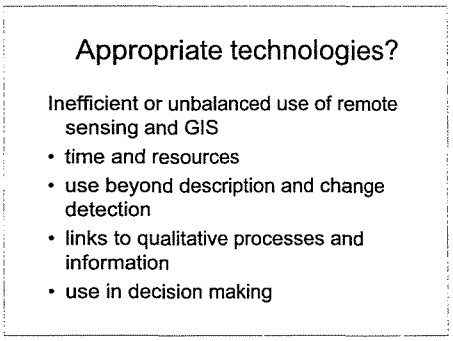


Figure 22

One of the things we need to find out how to do is include qualitative data and processes in our geographic information systems. For example - how do we include household data? How do we include local knowledge rather than knowledge gathered from satellite imagery? Another thing that I do not think we are doing very well is transferring the GIS and remote sensing systems to decision-makers and stakeholders in ways that they can make intelligent and useful decisions.

Now, not everybody is at fault here, there are some great examples from work in the Amazon, from Thailand and in the People and Pixels book that we produced for the US National Research Council, of people using GIS and remote sensing in effective and intelligent ways. However I just want to say that I think it is a challenge for social scientists to figure out how to use these technologies well. A new challenge is how we are going to use the more detailed, multivariate and more frequently available data from the platforms like the Earth Observing System that are going up this year. I am not sure we are ready to use those intelligently.

The fourth challenge that I wanted to mention is the issue of globalization, and I will not spend

much time on it here. I think what we need to do is really look at what is going on in the social sciences with issues of globalization because of the significant impacts on land use that I have already mentioned for Mexico (Figure 23-1, Figure 23-2). We need to look at changes in the international trading institutions and at economic restructuring and focus particularly on how local people are responding to those changes in the global economy. I do not think we can use the traditional economic models because what we are learning about globalization is that firms and individuals do not respond to it in the way that neoclassical economics assumes.

Let me just wrap up by mentioning the final challenge that I mentioned in my abstract which is that of implementing truly collaborative and carefully comparative research programs. Comparative studies need to develop rigorous frameworks for comparison, generalization and for the identification of singular local conditions including both quantitative and qualitative components and common protocols for data collection and analysis. Collaborative projects must find ways to fund, develop resources and take advantage of local knowledge in different regions, involve stake holders and enable research partners to influence local and international policies.

One final thought is to remind ourselves that the study of land use and land cover change, while intellectually engaging relates to real and overwhelming concerns of human well being and survival. Our work is also in the general interest of many of our colleagues in the social sciences, because our findings provide insights into overall human behavior, political institutions, demography or economic predictions. We need to engage more of our colleagues in our attempts not only to advance theory and method but also to answer immediate and urgent human questions. I know that many of the land use papers presented here in Shonan will illustrate these and other questions and may demonstrate that we're already a long way towards meeting the challenges that I have described. Thank you.

Figure 23-1

Figure 23-2

Invited comments on the talk of Professor Diana Liverman

Shidong Zhao

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Commission for Integrated Survey of Natural Resources,
Chinese Academy of Sciences
3 Datun Road, P.O.Box 9717, Beijing 100101, People's Republic of China

Good morning ladies and gentlemen!

Thank you very much Professor Graumlich, and the Planning Committee of this meeting for giving me an opportunity to comment on the remarks given by Professor Liverman.

The remarks provided by Professor Liverman reflect the important challenges for LUCC research and especially for developing countries. The challenges identified by Professor Liverman clearly outline the research challenges which need to be addressed for the LUCC community to succeed and to contribute to finding solutions to regional social and environment problems, and lead to global solutions for these problems too.

For instance in the Asia, the funding organizations have involved and facilitated the formation of the regional coordinated research activities in the regional research centers of the global change studies in the Temperate, Southeastern and Southern Asia located in Beijing, Bangkok and New Delhi through START and APN initiatives, called TEACOM, SEACOM and SASCOM. The TEACOM region has initiated several international studies related to LUCC, such as the Land Use in Temperate East Asia, the Regional Climate Modeling, and the Productivity and Sustainability of Ecosystems in China.

In many developing countries we are currently faced with both social and environmental challenges that need input from the LUCC scientific community.

Another related challenge we are facing is related to the breakdown of global and national level land use policy making which does not meet the local needs towards a "Transition to Sustainability." In this case, the three following questions are raised:

How will the policy decision effect the implementation of this transition?

How will the global and national policy mechanics facilitate "bottom-up" efforts for better land use management decisions?

How do we promote land use policies which enhance the local sustainability and also enhance the national and global goals of a sustainable global system?

In order to meet these challenges to LUCC research, I would like to suggest that all of us pay much attention to the following issues:

Data issues: including data collection, management, archiving and sharing.

Integrated research approaches: including interdisciplinary research, and joint experimentation like observation, analysis and synthesis.

Partnerships between developed and developing countries for joint research implementation. I would like to give you an example from my own experiences. Three years ago, supported by the

MacArthur Foundation, the scientists from American, Indian and Chinese Academies started to work together and developed a joint project called "Interactions between Population Growth, Consumption and Land Use Change." During implementing this project, all of us have learned a lot through working together. We are going to show some of the results of this project in the afternoon of 26th during this meeting. Dr. Solecki from the United States, Dr. Remakrishnan from India and myself will make the presentations on it. It is a very successful project, showing the benefits of developing the partnership between scientists from the developed and the developing countries.

Education for development agencies for the need of an integrated approach for land resource development projects building from the LUCC research principles.

Thank you again for this opportunity to comment upon this critical set of issues facing our society today. The commitment of this science community is warmly felt and inspires hope for the future generation.

Thank you very much!

Discussion

Chair/Lisa Graumlich:

I would like to open this session to questions and comments from the floor. Please speak up when you do articulate your questions.

Questioner A:

One goal of your studies amongst others was to see whether you could predict land use changes in the Mexican area. In your challenges, you did not come back to that particular goal. I would like to know your view on whether you can predict or whether you could predict reactions to those response relationships on changes in the world market on events relating to the climate or other events.

Diana Liverman:

That is a good question. When we started to try to do the prediction, one of the reasons was that it was done was in concert with Mexico's global change program where they were trying to understand what their carbon emissions might be from land use over the next ten to twenty years. A set of projections were made but then because of the economic and climate variability in the 90s that I have discussed they were quite inaccurate.

I think my conclusion now is that perhaps the most intelligent thing for us to do is to do more scenario work rather than trying to just say, "Now this is just the trajectory we are on." Also I think we have to be more innovative about the type of shocks and changes that we might include in those scenarios. We need to think through the possibilities of dramatic agrarian reforms, or very severe El Ninos and what those might do to land use and land cover change. Perhaps what we need to do now is use sensitivity analysis of scenarios to give bounds for what possible land use changes might be, and what the policy responses as well might be.

My main conclusion based on what we saw in Mexico in the 90s, was that using the methodologies that we were using at the beginning of the period, no, we were not able to do a good job at all. However, I think what we need to do is develop some new methodologies or some new frameworks for being able to incorporate the effects of globalization and especially neoliberalization on land use. This is because the sweep of globalization and neoliberal land and agricultural policies are not just effecting Mexico, the impacts are felt throughout Latin America and Africa. Those are areas where we are going to see quite dramatic land use changes, particularly as individual farmers on the ground try to figure out how to make a living. They sometimes they do not know what to do in response to open markets so they are switching back and forth pretty rapidly between crops and input usage.

Questioner B:

Congratulations on your excellent presentation. What I would like to ask you is regarding another dimension of globalization that seems to me to have a highly significant impact upon land use and land cover. This is the expansion of global crime and the weakening of the rule of law in very significant regions of the world, in the south particularly but not just in the south.

It is my view that there is a vicious cycle between the disintegration of the social world, the weakening of the rule of law and expansion of global crime. Not just regional or local crime but

those connected with global crime; smuggling, narcotics traffic and so on. This impacts on land cover and land use also in a way that is highly significant but I did not hear anything relating to this issue in the LUCC research.

I am asking this. How do you see this? Let's say that this is the another side of globalization.

Diana Liverman:

I think that is a very important point and I will answer it just with some anecdotes from the work that we did in Mexico. I do not think we anticipated when we sent students out into the field, both U.S. and Mexican students, the number of times they would encounter narcotic trafficking or people involved in drugs when they were doing field work. Several times I was very concerned about the presence of researchers, because when you are carrying a global positioning system into an area which is under the control of the drug growers, you can look suspicious.

Certainly in Mexico and the areas that we were working the drug issue and its impact on land use is a very important one. However I think that the issues you are raising are issues to do with enforcement of land use regulations and the inability of government to control the way the land is being used. And I think that one of the challenges here is that in Mexico and in many parts of the world, there is also a push to a more democratic and more decentralized environmental management. The big challenge there is to strengthen the local institutions rather than the federal or national ones, because you are starting to see decentralization to the local level. That is both where there is both more potential for crime or lack of enforcement but also there is great potential for communities to take charge and say, "No we do not want this type of activity in our community."

So I think that you raise a very important issue, and I have not really seen people address it very much in their research. In many cases when we are working in local communities, we do not even want to even want to write about the issue of the impact of drugs on land use because of the way in which it could endanger some of our local informants. But it is definitely there in very large areas.

Chair:

To ensure that we get at least a little closer to the schedule, I am going to cut off the questions at this point and before we thank our speakers one last time, I would like to suggest that we reconvene at 11 in the various parallel sessions. I would like to thank both the speaker and the commentator for a job well done.

Plenary Talks

Session 2

Chair: Ronald Rindfuss
(a member of ISPC of the 1999 Open Meeting)
Carolina Population Center, The University of North Carolina at Chapel Hill (USA)

Speaker: Wolfgang Lutz
International Institute for Applied Systems Analysis (IIASA) (Austria)

Commentator: Naohiro Ogawa
Nihon University Population Research Institute (Japan)

Demographic Change and the Environment

Wolfgang Lutz

Leader of the Population Project
International Institute for Applied Systems Analysis
A-2361 Laxenburg, Austria

Thank you very much, Ron for your kind introduction. Being that I am the first speaker after lunch, I am happy that I am here in Japan, where you have a nice cup of tea after a meal, rather than lots of wine as in Austria and other European countries. Therefore, hopefully, there is less of a need to take a nap during this after-lunch session.

I also want to thank very much our Japanese hosts and the organizers of this meeting for featuring the session on population and the environment prominently on the agenda of this meeting. I personally think, and of course it may be a biased view, that this is one of the most exciting fields in the analysis of the human impact on global environmental change. It is still a somewhat confusing field, but there is little doubt that the questions concerning demographic change and the environment are regarded as relevant both by the public as well as by the scientific community. Even many of the heads of state of the world have said on different occasions, that it is probably one of the main challenges of mankind to somehow reconcile the population trend and the environment.

On the other hand, if you look at the scientific work, at the articles published, you get an impression of a state of confusion in the field — confusion in terms of methods and variables used. Therefore, it is no wonder that there is confusion about the results, about the nature of the varied population-environment relationship. What is the relationship?

The past ten years have seen an upsurge in studies that at least have the words "population" and "environment" in their titles. At many international meetings there have been an increasing number of sessions dedicated to this topic. I recently made an attempt to summarize some 250 to 300 studies that have been produced over the last 10 years, and they have the words "population" and "environment" in their titles. I found them through various library research strategies. The majority of these studies have been done by anthropologists, but you can find any discipline that you can think of among them. It is funny, at least to a demographer or to somebody looking at population and the environment, to see which strange or unfamiliar disciplines have tried to make a contribution to this field. In this sense, it has been a very rewarding experience to see what is available in terms of efforts to try and understand the new promising avenues of research. However, it has also been a very frustrating experience because of my unrealistic expectation of finding something that could be generalized. The studies have simply been too different in terms of the questions asked, the approaches taken, and the variables used. At the end of the day, there was very little that could be summarized as being a general finding of this large body of studies upon the population and the environment.

In the International Union for the Scientific Study of Population, which was founded in the 1920s and consists mostly of scientists who are in the core field of demography, we recently discussed the subject of what should be done by our union in the field of population and environment. During this discussion, one highly distinguished quantitative demographer said: "My mother tells me that this is an extremely important field, but I do not know what to do about it." I think this nicely

captures the state of the field. There is a clear feeling from the public and common sense, that the increasing number of people does have an impact on the environment, but at the same time, there are increasing difficulties in getting a solid analytical handle on this difficult question.

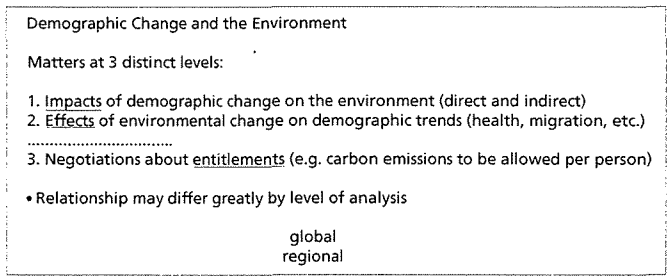

Figure 1

Let me start by distinguishing between three levels of analysis(Figure 1). The topic of this session, "Demographic change and the environment," really should be addressed at three different levels. The first, and probably most common level of analysis, is "impact of demographic change on the environment." There are some very direct impacts, and many more numerous indirect impacts.

The second level of analysis, which is on a different question and uses different data and different approaches, is "how do the different aspects of environmental change affect the demographic trends?" This is mostly a question of health (what are the health implications of environmental change?) and environmentally-induced migration trends.

Then there is the third level, where the global population numbers probably come in most directly. Many of the issues on the first and second levels deal with regional aspects, but what matters most at the third level are the global figures that are used in negotiations about entitlements. This is not the real world. The dotted line indicates the world of negotiations, of ethical issues and of the question of entitlements. For example, given that a certain absolute amount of carbon emissions occur, you calculate how much this makes per capita that is allowed or desirable. It makes a big difference whether there are 6 billion people or 12 billion people on the planet, because it means that every individual would have half the entitlement of the other scenario. At that rather abstract level, population numbers clearly matter.

Finally, as I said earlier, I will try to cover both the global and the regional levels because the relationship between population and the environment may differ greatly by the level of analysis. Before starting I want to make another clarification. When we talk about population, it is not the same as talking about people, or about the human impact in general. When we talk about population, we talk about the more specific issue of demographic change. It is, therefore, helpful that this session was not simply called "population and the environment," but more precisely "demographic change and the environment."

Population (more specific)	≠	People (broader)
Demographic Change	is part of	Human Impact (Activity)
↓		
Quantitative Aspects of Population		Includes also
- Size		- Institutions
- Age structure		- Economics
- Structure by		- Culture
Sex		...
Place of residence		
Labor force participation		
Education		
Ethnicity		
...		
- Growth rate		
- Fertility		
- Mortality (Health)		
- Migration		
- Spatial distribution		
- Households, families		
...		

Figure 2

What do we mean by demographic change? It is the quantitative aspect of the population(Figure 2). It is the size of the population, the age structure and a number of other structures like sex and place of residence (such as urban or rural). Labor force participation, educational status and ethnicity are other very important structures of the

population. Then we have several more dynamic features like the growth rate of the total population, fertility levels, mortality levels and migration. Some further dimensions are the spatial dimensions, spatial distribution, the structure of households and of families, and so on.

These are the more demographic dimensions in a stricter sense. If you talk more generally about human impact, this also includes an analysis of institutions, of economics or the cost/benefit issue, and the issues of culture in the broader sense. At this point, when we talk about population impact, I will try to limit the analysis to these more demographic aspects and not talk generally about human impact.

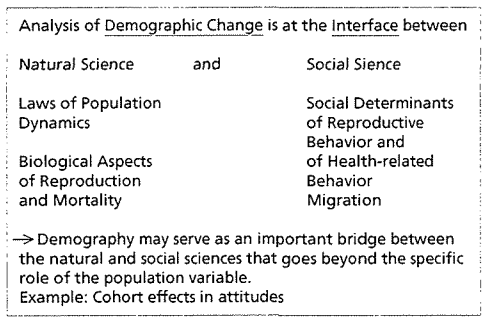

Figure 3

The analysis of demographic change is rather interesting because it is right at the interface between natural science and social science(FIgure 3). On the one hand, the growth of the population and many of the features follow the laws of population dynamics, which clearly is a natural science phenomenon, not too different from the dynamics of any animal population. There are very important biological aspects of reproduction and of mortality and human health. On the other hand, there are many social determinants that we call reproductive behavior, the conscious decision to have a certain number of children. And there is also health-related behavior. These are socially and economically determined. Of course, migration is another phenomenon that is very much determined by the socioeconomic environment.

In this sense, demography may serve as an important bridge between the natural and the social sciences. I think this bridge goes beyond the specific role of the population variables because we can learn something of the methodologies about how to bridge these two paradigms of research. Just a small example is the demographic notion of the cohort effect, which turns out to be a very important analytical tool when trying to analyze the changes of attitudes in populations. For cohorts, new attitudes are often formed at an early age and remain with them throughout life. Some of these demographic methodologies can well be used to study some of the very qualitative attitudinal changes.

I decided this morning to do the presentation differently from what I had originally planned, based on many of the discussions I had with you last night and all of this morning. Many of them referred to the Ehrlich-Holdren identity of I=PAT. I had not planned to talk about it because it is not appropriate as an analytical tool, but since it seems to be a common point of reference, I think I must spend a few minutes on it(Figure 4).

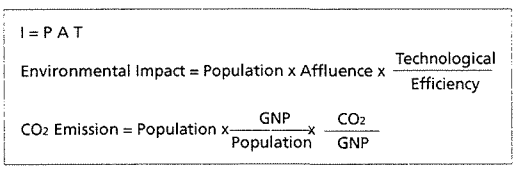

Figure 4

As a brief introduction, what we are talking about here is an identity equation that in a way tries to explain the environmental impact as a product of a population's size. For instance, CO_2 emissions equals population times Gross National Product divided by the population times the CO_2 emissions divided by the GNP. This all cancels out, so the CO_2 emissions equals the CO_2 emissions. It is an identity that you could arbitrarily expand by replacing the variables. For instance, instead of the population, you could take the number of fireplaces or the number or engines. You could introduce,

if you want, the number of environmental NGOs. As long as you enter them as both the numerator and the denominator, the identity holds. Of course, whatever variables you introduce into this identity will impact upon your results and the way in which you interpret the results. Hence, your choice of variables influences the outcome.

"Population growth plays a prominent and probably predominant part in environmental problems... The most productive and readily available mode of adaptation to the global-warming threat would be to reduce [developing country] population growth."

Norman Myers

Figure 5

Before I criticize it too harshly, let me say one positive word about this equation: It is useful to refute any attempts of mono-causal explanations. I want to show you two statements, representative of two prominent groups of speakers(Figure 5 and 6). One is by Norman Myers, which says: "Population growth plays a prominent and probably predominant part in the environmental problems... The most productive and readily available mode of adaptation to the global-warming threat would be to reduce [developing country] population growth." It puts all of the emphasis on the population variable. The Third World Women's Group called "Dawn" says, "Population control in the South is a new form of Northern Imperialism. White men fear the fertility of our wombs and do violence to us while the real environmental problem is Northern overconsumption." It puts all of the emphasis on the other variable. Hence, the one good thing about the I=PAT equation, is that it shows that there is no mono-causal relationship. At least you have to think that there are several factors that are contributing to it.

"Population control in the South is a new form of Northern Imperialism. White men fear the fertility of our wombs and do violence to us while the real environmental problem is Northern overconsumption."

DAWN Statement
Third World Women's Group

Figure 6

That is about it as far as the usefulness of I=PAT goes, I think. For any further analytical purposes it is rather inappropriate. Let me give you five points that, in my opinion, show why it is not an appropriate analytical tool(Figure 7).

As I have already said, the three factors that are included in the identity are rather arbitrary. One could easily include other factors or even more factors. I am going to show you an example of substituting the population number by the number of households, making the I=PAT into an I=HAT equation.

What is wrong with I = P A T ?

1. Three factors included in identity are rather arbitrary. One could easily include other/more factors, e.g. I = HAT
2. There are impacts that are not proportional to population: I = (PAT) +N
3. The three factors are not independent
   A↑⇒P↓, P↑⇒A↓, P↑⇒T↑
   Demogr. Malthus Boserup
   Transition
4. Feedbacks from impacts on P, A, T possible and likely
5. Cannot deal with negative growth in one of the factors, e.g. technology

Figure 7

Another problem is that there are clearly impacts that are not proportional to population, so you have to come up with an additive constant. Just think of military activity, which often has large environmental impacts and which is really dependent upon the decisions of some generals or politicians, but certainly not directly proportional to the number of people in the country. There are many other things that you can think of that are not directly proportional to the population.

Another even more serious issue is that the three factors are not independent. Much of the literature

on population development talks about the different manners of interdependence of these factors. For example, the usual demographic transition paradigm says that if affluence goes up, the population growth rate and fertility tend to go down. Another prominent model assumes that if population grows then affluence tends to go down per capita. Or you may have the Boserup model assuming that if the population goes up then rates of technological improvement may go up. These are all issues that focus on the interactions, the correlation among these three factors.

Another important shortcoming is that, in the real world, feedback from the impact on all factors — *population, affluence and technology — is possible and I would say even likely. So if you only* use this equation as a basis for measuring the effects, it does not really account for this.

There are further, more technical, problems in that it is really hard to deal with some negative growth in one of the factors, such as technology improving, while affluence increases at the same time. They may cancel out. This is a technical problem when trying to portion the different factors. Let me give an example of one of the many calculations that we present in a forthcoming book on population and climate change(Figure 8 and 9).

Sources of growth of energy consumption, world regions, 1970-90: Average annual percent change and, in parentheses, percent shares by world regions attributable to population growth or to growth in the number of households, and to the combined effect of changes in income and in technology.

	I = P A T model				
		of which			
	Growth rate of energy consumption	Due to growth of population	Due to change in income per person		Due to change in technology
Less developed regions	6.7	2.2	3.0		1.5
	(100.0%)	(32.8%)		(67.2%)	
More developed regions	2.1	0.7	2.0		-0.6
	(100.0%)	(33.3%)		(66.7%)	
	I = H A T model				
		of which			
	Growth rate of energy consumption	Due to growth of number of households	Due to change in income per household		Due to change in technology
Less developed regions	6.7	2.5	2.7		1.5
	(100.0%)	(37.3%)		(62.7%)	
More developed regions	2.1	1.6	1.1		-0.6
	(100.0%)	(76.2%)		(23.8%)	

Figure 8

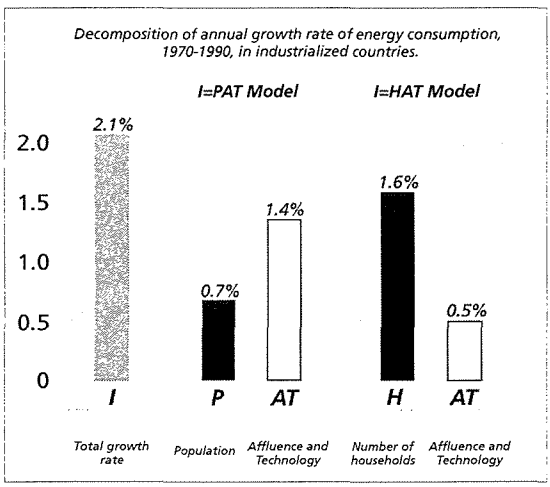

Figure 9

This is simply to show what happens if you take the I=PAT model and compare it to an I=HAT model, when you take the households (H) as the emitting unit. First, taking population as the emitting unit, we have developing countries and developed countries. What we look at here is the growth rate in each of the components. This is an additive model, taking the logs of the Ehrlich-Holdren equation. Let's look at the developing countries. We have about one-third being attributed to the growth of population and two-thirds to the combined growth of income per person and change in technology. For the developed countries, you have similar aggregate effects, but very different impacts of affluence and technology. Here you already have the problem of cancellation. You have a 2% increase in the income per person and a -0.6 decrease in improving technology. In the aggregate these effects cancel.

There are good reasons for assuming that not all emissions are due to individual emissions, but rather depend on households. Consider, for instance, refrigerators or other commodities, or the household heating. These are fixed emitters that may count more than the number of people who live in the household. If you take this view, then we have a very different picture, because households have been increasing in the industrial countries far more rapidly than population due to the aging of the population, lifestyle changes, later ages of marriage, higher divorce rates, and so on. Under this approach the calculations show that three-quarters are being contributed by the household variable, which is the population variable in this model, and only one-quarter by the others.

I think I have to go on but still remain at the level of global analysis. In the book on population and climate change, we tried to summarize the state of the art in the field of population, forecasting what we know in the field of climate change and how these phenomena inter-link in both directions.

Let me briefly summarize what we know about population(Figure 10). There are three certainties that we face in our probabilistic projections and which coincide with the UN projections and the World Bank projections. 1) The world population will continue to grow substantially, although now there is a very high probability that it will not double any more. It was common knowledge until recently that it would double, but right now we think it may stabilize at eleven or even ten billion people, and may then start to fall. 2) We know that the distribution will continue to tilt from north to south. There will be a much higher population growth in the south, and 3) it will continue to age in all world regions. The proportion above age 60 is certainly going to double; it may even triple or quadruple. There are major uncertainties related to the speed of the fertility decline in developed countries, but there are also uncertainties related to the future path of mortality. These tend to be disregarded by the UN and other population projections, but due to AIDS and also due to the uncertainties about the upper limits of longevity and the limit to human life expectancy, there is increasing scientific uncertainty. This increases uncertainty in the age distribution and total size of population projections.

What is Known and Not Known About the Outlook for Population?

Three things are near-certain based on IIASA probabilistic projections:

- world population will continue to grow substantially
- its distribution will continue to tilt North to South
- it will continue to age

Major uncertainties:

- for world population size, the major uncertainty is the speed of LDC fertility decline
- for world population age structure, mortality is also an important source of uncertainty
- population stabilization, which results from the assumption of gradual approach to replacement-level fertility, is really only a convenient assumption.

Figure 10

The notion of population stabilization, which has been something of a common notion and political goal in the past, is now in question. Because there is the prospect of sub-replacement fertility,

even possibly at the global level, which could go on for quite some time, this may result in the long-term decline of the world population, starting in the second half of the next century.

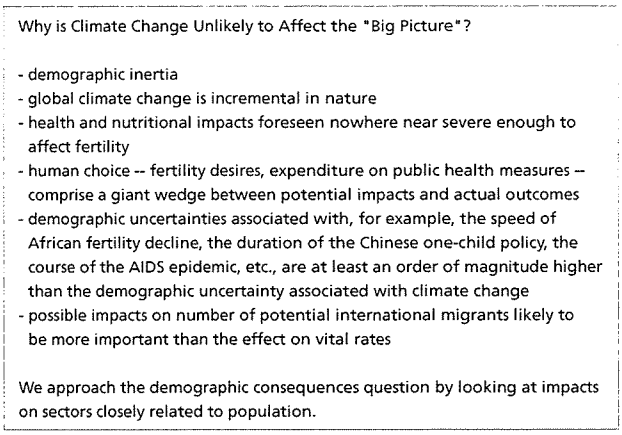

Figure 11

I will briefly try to summarize the question, "Why is climate change unlikely to affect the big picture of population?"(Figure 11) This is because of the demographic inertia, the momentum of population growth, which is embedded in the age structure of the population. Also, global environmental change is incremental in nature. What forms the population's size and composition by the second half of the 21st century are the next 20 to 30 years of fertility and mortality rates. Only if the changes are very extreme, will we see the effects earlier. By this time the effects of climate change may not yet be strong enough.

Then, of course, there is human choice. Increasingly, family size is being controlled by human desire. It is human choice that determines the size of the family. As to mortality and health, both public expenditure and lifestyle make a big difference. Both can react to environmental change.

International migration is an area that is more likely to be affected by environmental change. For global population size, migration makes no difference, but for regional population size, it can make a temporary difference. We have to keep in mind that the main determinants of population are fertility and, in the second order, mortality.

Having said so much on the global pattern, let me go back and try to see what can we do at a more in-depth level for more regional population-environment issues. I think we really have to go back to first principles, because this is a highly confusing field of studies, and it makes sense that we step back and think what are we trying to study, and what approach should be taken. Usually we see the population and the environment as two independent entities or boxes. Here the population growth has some impact on the environment and in some cases, you will study the impact of the environment on the population. However, population is not independent of the environment. We know, of course, that the human species is part of nature, and that it cannot exist without the environment(Figure 12).

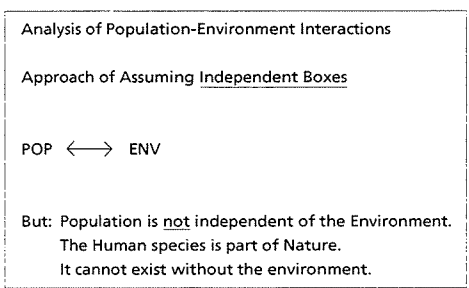

Figure 12

So why do we analytically treat it as two independent issues (boxes) that are linked by arrows? It is much more appropriate to have another view, where the population, the demographic analysis if you want, is embedded in the broader field of the development, which is the man-made

environment, its consumption, its production, and its social and economic activities. These are embedded in the environment. The laws of nature apply to our economic activities as well as to the population, so both are part of the huge environment. If you take this approach, some of the analytical tools look somewhat different. I will try to show you an example, if there is time for me to deal with it(Figure 13).

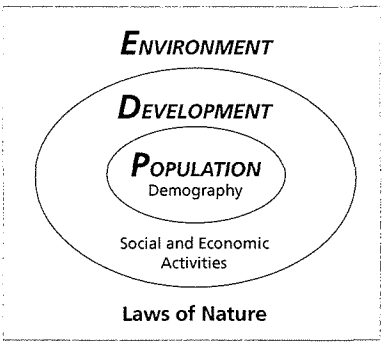

Figure 13

The environment is a rather vague notion, so when doing any specific analytical studies we have to try to structure the environment; we have to try to get a better handle on it. In doing so, I think it is useful to go back to the very origins of occidental thinking, to ancient Milet, about 400 BC, where Anaximander, one of the pre-Socratic philosophers, who is said to have done the first map of the world, talks about the four elements. He talks about land or earth, water, air and fire. It turns out that these four elements pretty much correspond to some quite usual classifications of the environment. As we see, for instance, in the 1992 Rio documents and others, we talk about the land, the composition of the soil, topography, land cover and land use. We talk about the water, rainfall, stream-flow, man-made systems, lakes, the sea and the ground water. We talk about the air, its changes in composition, winds, humidity and temperature. Fire we call energy these days, and the only other "elements" or new concerns really are changes in the other species, the changes in biodiversity(Figure 14).

For analytical purposes we must be more specific about the variables we study. For the population, we look at age, gender, education and other characteristics such as place of residence or educational status. We have changes through fertility/ mortality, migration, schooling and other social movements. In the area of development, we have consumption by the economic sector and production. We have national and international trade. And finally, we have government policies in the social, economic and environmental fields.

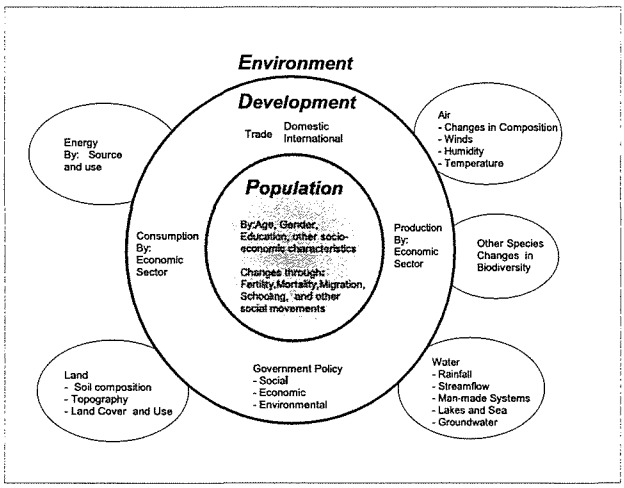

Figure 14

These broad categorizations form a framework that is quite useful for specific case studies. It provides a general approach to get a better hold on the specific nature of the population-development-environment relationships in different parts of the world. In each specific case study you really need to assess the nature of the relationships under specific climate conditions, under specific social, ecological and cultural conditions. That allows you to have a series of specific case studies based on good data, enabling you to derive some generalizations.

IIASA has done some case studies, as some of you may know, for the island of Mauritius, Cape Verde, and the Yucatan peninsula. Right now we are in the process of studying Namibia, Botswana

and Mozambique. In the future we plan to go into Asia with a series of case studies on population and sustainable development. We hope to be able to derive some important generalizations from a series of in-depth case studies performed under a common analytical framework.

Here, I want to show you another example, something that is really in the state of being developed. It is a model that we did over the past months for the United Nations Economic Commission for Africa. We call it the PEDA model, "Population, Environment, Development and Agriculture." It is quite interesting to see that the United Nations system is now restructuring around this notion of sustainable development. In the past they had separate population and agricultural divisions. Now, at least in Africa, they have formed a new division called "Food Security and Sustainable Development", which includes the old population division. They are trying to focus on the nexus issues between population, food scarcity and the environment. Their goal is to convince African policy makers that it is important to look at these things jointly because they depend on each other. This is quite a task, because the traditional compartmental approach is so firmly embedded in the system.

We were asked to quantify what is usually called the "vicious circle" model. Some of you may be familiar with this model, which goes back in part to the writings of Partha Dasgupta of Cambridge University. UNESCO and other international institutions have also taken up this mode of thought. It has been summarized, for instance, by Mark Nerlove by something called "the parable of the firewood": If there is a shortage of firewood you, of course, collect it in your near vicinity, then you collect further and further away. Under these conditions it makes perfect sense for a family to have many children, in order to have many collectors of firewood. But the more people you have collecting firewood, the more it degrades the land and the less firewood you have to collect in the surrounding areas. Therefore, you have even more of an incentive to have a large family. This is an example of the vicious circle, a positive feedback loop, if you want, although it is difficult to find empirical evidence for the particular mechanism(Figure 15).

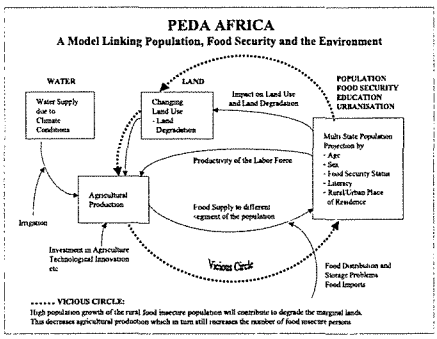

Figure 15

In the PEDA model, we try to operationalize this vicious circle reasoning in a more general way. We have a multi-state population projection by age, sex, food security status, literacy and place of residence. If the size of one group, namely the poor, food insecure and illiterate people, increases then it will cause land degradation. This, together with some assumptions about the water and other inputs to agricultural production, will impact on the food production, which will in turn feed back upon the food security of the population.

Let me briefly show you the right-hand side of this model, that we call the population segments(Figure 16). We have the population grouped into eight groups, each of them broken down by place of residence, literacy status, food security status, age and

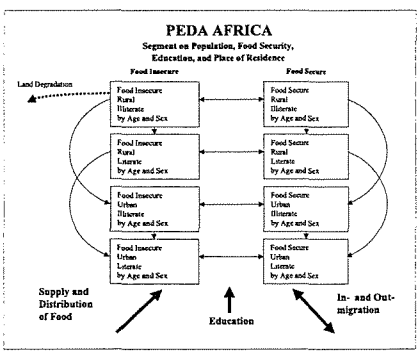

Figure 16

sex. We have a little age pyramid in each of these eight boxes. We apply the rules, the methods of multi-state population projection, which is a rather sophisticated demographic method.

I think this type of multi-state model is very appropriate for this kind of analysis of interactions with the environment. This is not an economic model. There is no income in it, so we do not need general equilibrium models. It is more of a population-based analysis, where you classify people by individual characteristics that can be measured on the individual level. These are directly linked to physical variables. Changes in land degradation feed back to food production. Another impact is the productivity of the labor force. This is an agricultural production function that we have taken from Hayami and Ruttan, something of a standard textbook in agricultural production. The literacy of the labor force is another factor contributing to total food production. Then we have a food distribution function which, after adjusting for the loss of foods due to storage and transport and after adjusting for imports and exports, distributes the total available food to the total population in the urban or the rural area. As we all know, some people will stay hungry even if the food is sufficient to feed everybody at a minimum, because some people, like the rich, will consume a higher proportion of the food, and the poor will get less(Figure 17).

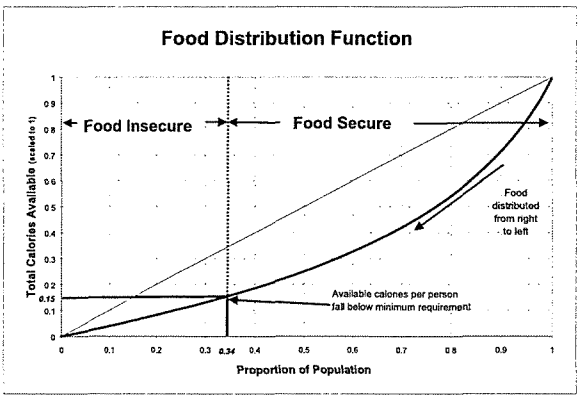

Figure 17

There is no time now to discuss the results. The chart shows you four scenarios for Burkina Faso(Figure 18). In short, it says that constant rates lead to a significant increase in the food insecure population. Investments in education and increased technological input (TI) to agriculture improve the situation, but a sustainable decline in food insecurity can only be achieved if both strategies are combined with a significant decline in the birth rate.

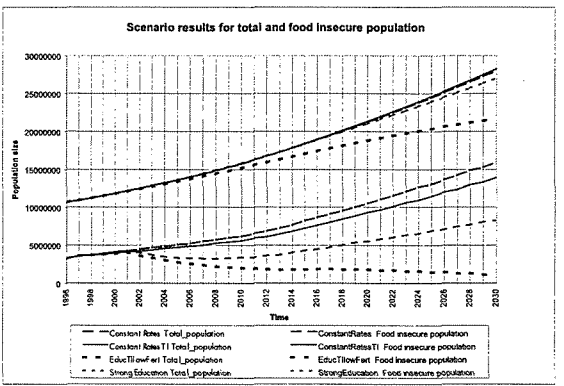

Figure 18

In conclusion, I would like to go back to the frustration I expressed at the beginning of this talk about the confusion in terms of methodological approaches, in terms of the variable to be used.

I see two ways out of this confusion. One way is to try to impose some common methodology. Measure at least the same kinds of variables and the same kinds of mechanisms in different settings. Then try to compare what is different between the different case studies and what they have in

common, what can be generalized.

Imposing a framework, however, is not a very popular approach. It is much more popular to let all flowers blossom, let everyone come up with his or her own ideas, and let the field develop more in the future. That approach is fine, but there is an important prerequisite for this "Let everybody do what he/she thinks is important." That prerequisite is good communication. Unfortunately many people try to reinvent the wheel all over again. They have an idea and they push it forward, without really looking at what other people have already done in the field.

Therefore, I think that there is an urgent need for better communication. This meeting is a very important contribution, as are other meetings, to enhancing this communication. Actually, the International Demographic Union and the International Human Dimensions Programme are currently negotiating to possibly initiate a common network based on the internet that would enhance communication on these issues of population and the environment. I am sure that we will see significantly increased communication in the near future. And there is hope for reducing the confusion in this promising field.

We need to be specific in our models and in the data that we use. We need to be explicit, above all, in the assumptions that we make. We need to look at what other people have done elsewhere and link up with our colleagues around the world for working on these questions. This is why I think that conferences like this one are so important. We must make sure that we transcend the disciplinary boundaries. I think that this is absolutely essential in the study of population and the environment. However, it is also essential that, when developing these research frameworks and methodologies, they deserve the name multi-disciplinary or even interdisciplinary, and do not fall into the trap of being non-disciplinary or undisciplined. Thank you.

Invited comments on the talk of Dr. Wolfgang Lutz

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Thank you very much. I very much enjoyed listening to Dr. Lutz's quite interesting and intellectually stimulating lecture. I have no disagreements with him, as we basically think along similar lines. However, I would like to add a few remarks, plus I would like to raise a few questions.

In the field of demography we have a well-known theory called "the theory of demographic transition." According to this theory, a society with high fertility and high mortality moves to a situation in which both fertility and mortality are controlled, as development progresses. This theory has been substantially reflected in a series of United Nations population projections including the 1998 version. According to the medium variant of this most recent version, the world's population is expected to hit the 6-billion mark this year and to increase to 9 billion by the year 2050. This implies that the population of the world will be growing at approximately 0.8% per year. This projection is based upon the assumption that fertility will decline further, thus, approaching the replacement level of fertility by the middle of the next century. If the current fertility and mortality remain unchanged in the years to come, the total population will be more than 20 billion, which is about three times as much as that for the medium variant.

My question is how much confidence can we really attach to these population projections? Demographers describe them as speculative exercises rather than forecasts. However, many non-demographers tend to accept them as a voice from the heaven, or exceedingly reliable.

My first point is that people, even the people here, tend to accept UN population projections or World Bank population projections as reliable population forecasts, but they are not necessarily correct. If you look at previously published projections and check the actual data, they tend to be considerably off. In recent years, new approaches have been developed for conducting population projections, and one of them is the expert-based population projection model that was developed by Dr. Lutz. Another population projection model was developed by a group of scholars from the University of California, Berkeley, based on forecasting model population projections. In these population projections, confidence levels are used that are similar to those used in weather forecasts when we are told there is a 30% chance of rain. This could be quite meaningful in terms of planning exercises. For me, I think that this is a quite promising area in terms of future population projections. In other words, with further progress to be made in these future population-projection techniques, we will be able to come up with more reliable population projections, which would serve as a realistic forecast rather than a speculative exercise.

Even though the projections could be more reliable or at least based upon more scientific methods, studying the impact of population change on the environment is still a formidable task to many researchers. As pointed out in a report published by the National Academy of Science (NAS) in 1986, there are numerous links between population change and socioeconomic development, including environmental factors. The report also showed that because there exist possibilities for response and substitutes, the effect of population growth on economic development is probably a modest one. Population matters, but its net impact is likely to be negligible. The validity of this view on population development and interaction is partly endorsed by IIASA's model on population

change for Mauritius. IIASA's Mauritius model is similar to the PEDA model, which he presented this afternoon. The interesting part of these modeling exercises was that indirect effects substantially offset direct impacts of the population on the environment. It is often the case, however, that many of these models assume constant parameters for their simulation exercises. In reality, parameters need to be changed over time. Some parameters are significant at a certain stage of development.

I myself build models, but I am concerned about the fact that there are some missing linkages, which could be quite serious, but because of the lack of data and theory available, my hands are tied. So I am just wondering if, in your PEDA model, you encountered any serious missing linkages, which would deserve further research.

The other point I would like to mention is that Dr. Lutz made an interesting remark regarding households rather than population. I think that is a very useful remark; however, in analyzing the impact of age-structural shifts on the socioeconomic system, the household is not enough. In Asia, for instance, inter-household linkages are considerably different from those observed in the West. In Asia, between the households, the parents and children have a very close flow of resources, so we need to apply the "dynasty" concept. A dynasty could be one unit of economic analysis.

In Asia, the population changes extremely fast. Japan was the first country to experience a decline in fertility with great magnitude after World War II, and then several other Asian countries followed suit.

What can we learn from these demographic transformations in these Asian countries? These Asian countries have been very successful in terms of economic growth; although, in the last few years they have run into financial crisis. One of the primary reasons for such remarkable economic achievements in Asia is its rapid fertility reduction. Because the decline in fertility was so swift, Asian populaces were able to accumulate quite a bit of capital by increasing savings. The productivity of workers went up quite a bit as a result of the capital-deepening effect.

In addition, if you look at per capita income, the population becomes a denominator, but the population also affects the denominator through the capital-deepening effect. To what extent does your model take this capital-deepening effect into consideration?

Another point is that, although population growth has been slowing down to a considerable degree in recent years in many parts of Asia, economic growth performance has been extremely spectacular. So we should pay great attention to the impact of capital deepening on the environment.

Moreover, changes in lifestyle could also be an important factor in terms of the impact of the population on the environment.

My final point is related to the I=PAT equation. Bongaarts, for instance, demonstrated, using a slightly modified version of this equation, that almost 50% of increasing CO_2 emissions comes from population growth in the developing region over a period of 100 years. I find this rather difficult to swallow. Many people tend to use this simple formula I=PAT, but I think we have to pay greater attention to the limitations of this equation. Especially, the mass media in this country tend to place too much reliance on this simple formula when writing articles that are often very sensational. We have to be more careful in drawing strong conclusions from a very simple framework of this nature. A more comprehensive analysis needs be done before claims are made toward concluding that population really affects the environment.

I think that we should do more research and that we need a more careful, complete analysis. Simple is often appealing, but not always accurate. We need more basic research to back up the validity of this framework. I believe that through these research activities, we can formulate more useful frameworks. Thank you.

Discussion

Chair/ Ronald Rindfuss:

We have time for questions and comments. While you are thinking of them, Wolfgang, would you like to comment on any of the questions? In particular the missing links?

Wolfgang Lutz:

Certainly in any kind of a model that you make there are lots of missing links. The crucial question is whether these are essential links that change the big picture or not. So in a way, the art of modeling is to try to be as simple as possible without being over-simplistic. This data is a first attempt to focus on this one specific mechanism, which is this vicious circle model. But much more critical research needs to be done in the individual countries to verify many of the relationships that we assume. It depends on the kinds of questions you ask, as to which links need more research and should be specified in more detail.

On your second point I could not agree more that going from the population to the household level is the first important step. Modeling the family networks needs to be done more extensively. We know that in Europe - I know in Japan it is even stronger - there is significant intergenerational transfer within the same family. Some people even claim that the role of the state is not so important because there are these economic transfers from one generation to the other within the family. This only makes sense if you are under an egalitarian system with similar incomes and similar family sizes. What we observe in Asia as well as in many European countries, is that those who have lots to give to their grandchildren tend to have small families. There are rich grandparents with just two or three grandchildren, and poor grandparents with 12 to 16 grandchildren. This may introduce an additional dimension of inequality into society. Such concerns have to be taken into account, and it is a very complex issue of what should be the role of the state as opposed to individual transfer in this clearly necessary intergenerational adjustment of wealth.

Chair:

Okay, questions or comments? Yes?

Questioner A:

My question is "Did you pay attention to the cultural dimensions of demography and environmental change, such as religious or historical or cultural dimensions?" "Maybe indigenous languages also?" Can you please explain the impacts they have in your models?

Wolfgang Lutz:

I entirely agree. These cultural dimensions are very much a driving force of much of the change that we see, and there are different ways of dealing with it. If you have more qualitative sociological social science research, you deal with them in a different manner. In demography we try to group people into different categories that have different cultural preferences, assuming that within each category there is some homogeneity, but that there are differences between the groups. Then we model these groups, how they change in size over time, how they behave differently. This is a partially quantitative approach of covering these very important cultural dimensions.

Questioner B:

I was interested in your analogy of weather forecast and probabilistic forecast. I think it raises an interesting point which you have not mentioned. No weather forecaster would make a forecast for three weeks in advance because there is a predictability time scale which is two weeks or less. There must be something similar in making projections on future population size.

I think that is one of the reasons why the IPCC Special Report on Emission Scenarios of which I am an author has four different families, four possible different futures which you must be aware of, Wolfgang. There is a marker scenario for each family and they have a very wide range of possible futures from this approach. Not just one and not probabilistic either. So, can you comment on the perceptions that there is a right number for the year 2100, for example, and that it is possible to know it rather than there is a lack of predictability.

Wolfgang Lutz:

In a way, population projections are easy because there are only three major parameters that matter: fertility, mortality and migration. At the global level migration does not play much of a role, unless you assume there will be some immigration from outside the planet. However, it is difficult enough to make assumptions on even these two or three parameters. Given this relatively simple structure, and then of course when these parameters are assumed and pass a certain level, it ends up in a highly non-linear cohort component population projection model. You can also make stochastic assumptions, distribution assumptions for a small number of parameters and have long term probabilistic population projections.

In addition we know that the population changes very slowly. There is a great inertia, a great momentum due to the tendency of the given age distribution. Even today we know from how many people were born in the last ten years, how many people will be 50 to 60 in 50 years time, only by adjusting for mortality. So this is really a very strong inertia that is not present in something like the weather forecast, where there are many parameters to worry about, and where things change more rapidly. I do not understand too much about it, but I have learned that it may have some completely chaotic elements that are very difficult to model.

In any case, this slow tendency of change and the small number of parameters in the demographic model allow you to make these long term demographic forecasts that you cannot make with other more complex models, where you really have to go to scenarios instead of probabilistic forecasts.

Chair:

I am sure you (Naohiro Ogawa) really want to add something?

Naohiro Ogawa:

I think there are two new developments in the population projection techniques. Right now I am trying to compare these new projections with conventional projections; these new population projections are based on strong, convincing scientific reasoning.

I am more willing to accept the new projections. The problem is that because these are based on the new methods, we have to wait and see how much accuracy these projections have. However, according to the simulation experiments done by the stochastic model of population projection developed by the Berkeley group, the U.S. Government population projections have a fairly limited amount of accuracy. If that is the case, it has severe implications in terms of future social security planning and other government long-term planning.

I would like to wait and see what will happen to the U.S. population in the future, by looking at the actual number compared to the predicted number over the next decade or so.

Chair:

Okay, we have got time for maybe one or two more questions.

Questioner C:

I understand that there is inertia. I understand that the time constant is longer than the weather. But presumably after you get up to three or four generations out, the probability distributions of these few variables grow. Though you may model it with only two or three variables, the lady behind me has pointed out that those variables depend on many other variable factors. So I ask one question again, "What the sort of predictability, at what point, how long can I look at these things before the inertia disappears and I am in trouble?"

Wolfgang Lutz:

Well, I have the transparencies in my room, but I was not really expecting to talk about probabilistic projections here. Yesterday at Nihon University I gave a talk on probabilistic projections. Essentially you get a picture that opens up like a trumpet as you project into the 21st century. Over the next 30 to 40 years the uncertainty is relatively small because so many people already live, and the impact of future changes in fertility are not all that visible. The mortality patterns tend to affect the very old people the most, and do not play such an important role for the size of the population.

So you see relatively narrow margins of uncertainty up until 2030, 2040. At that time, the baby boom generation of the western countries is going to pass the age of 60 and come to retirement. All of the projections see an increase in what we call the old age dependency ratio, the proportion above 60. There is a very narrow margin of uncertainty, and you can project this with a very high margin of confidence. However, after 2040 or so, it opens up like a trumpet, and the 95% confidence interval becomes much broader.

Chair:

Let me make it clear that what is being discussed here is the size of the population and not fertility or mortality rates. When we talk about fertility or mortality rates, we are confident for at least 7 or 8 weeks. Last question, the gentleman in green, please.

Questioner D:

I would like to know how much demographics captures the evolving trend in some developing countries, perhaps not all. It is not only affluence that can force you to reduce the number of children you want to have in order to have a better life. Hardship can also cause this. In which case with the imposition of various stock riser's programs in developing countries, many households are being forced to reduce the size of their families. In what way, how much of that is being captured by demography and how will it perhaps affect the current model in our future?

Wolfgang Lutz:

There are several relevant questions that you are touching upon. The first is, of course, the question of data, what information do we have, what reliable data, especially within the African countries

where there is very significant uncertainty as to the actual population size. The censuses often do not give us very reliable information.

We do have some much more reliable information from some consistently conducted surveys that have asked a certain proportion of the population about the average family size, about mortality patterns, etc. So we are rather confident about the approximate level of fertility by educational group, by urban place of residence. However, we are not certain about the actual number of people living in a specific country.

The second question relates to how fertility reacts to certain changes in the natural environment or in the economic and social environment. This varies from place to place, and depends on social and cultural conditions. It is hard to find a general pattern.

If I have understood you correctly, one big question is how does a crisis, an economic crisis or a drought affect family size? Here we can see two different patterns of behavior. The more traditional, sometimes called the pre-modern pattern, is that families who come under economic pressure have more children. This is because some of these children are going to die due to high infant mortality, and they need more children to collect firewood and so on. It is beneficial to the household to try to have more children to survive.

It is interesting to note that at a certain stage of development, such as now in Bangladesh, where the population has a certain degree of basic education, it suddenly reverses. The economic misery, if you want, tends to reduce fertility. People have fewer children when there are difficult conditions, because they cannot afford the schooling for the children that they want. There seems to be an interesting threshold built in. At first they react with higher family size and later with lower family size.

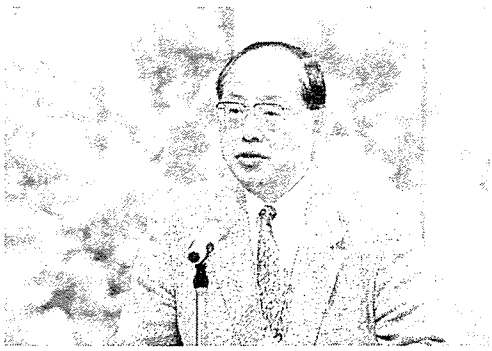
Chair:

Okay, I would like to thank our speaker and our commentator. If you have more questions, please speak with them during the coffee break. Thank you.

Plenary Talks

Session 3

Chair: Elena Nikitina
(a member of ISPC of the 1999 Open Meeting)
Institute of World Economy and International Relations, Russian Academy of Science (Russia)



Speaker: Akio Morishima
Institute for Global Environmental Strategies (IGES) (Japan)

Commentator: Elinor Ostrom
Workshop in Political Theory and Policy Analysis, Indiana University (USA)

Decision-making Processes and Global Environmental Change

Akio Morishima

Chair of the Board of Directors, Institute for Global Environmental Strategies
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Thank you, Elena, for your kind introduction. Good morning to my fellow scholars. This morning I will talk for 35 minutes, I hope, on the subject of Decision-Making Processes and Global Environmental Change. The abstract of my talk is on pages 14 and 15, but I will not read the abstract. Rather, I will try to deviate a little bit from what is described in the abstract. My speech is divided into five parts:

1. The characteristics or factors of global environmental issues that affect decision making at the international and national level.

2. In view of the factors mentioned in part 1, I would like to point out the difficulties of decision making in global issues.

3. I hope to introduce you to some episodes that occurred at the COP3 Kyoto Conference, to show how international decision making has been seriously affected by national interests.

4. Is there any way to cope with this decision-making process?

5. I would like to mention some problems that we are facing at the national level.

Thirty-five minutes is not a long time. And even though I believe that I am an experienced teacher, I cannot guarantee that I will be able to cover all of the subjects which I have just mentioned, but I will try.

First, the factors of global environmental issues that affect decision-making processes at the international and national levels are:

A) Long-term phenomena

B) Wide areas affected

C) Scientific uncertainty

D) Most global environmental issues have a serious direct or indirect impact on the national economy. That is why the national, sovereign governments try to protect their economy by concluding international agreements.

The first factor which makes decision-making for the global environmental problems difficult is that those problems derive from the long-term phenomena. The impacts of long-term phenomena have been realized very gradually. Sometimes, it takes decades for the policy-makers or the public to realize the problems. Because it takes a long time for the phenomena to appear, unlike other issues that have direct impact on present life, decision-makers are inclined to postpone decisions. That is a direct result of long-term factors on the decision-making processes.

Second, wide areas affected, since the phenomena happen in all countries or at least cover wide areas. For example, the causes of CO_2 emissions include industries and automobiles, and even the

cooking and heating in households. When making decisions, it is very difficult to focus on what kind of measures are effective, and if there are any measures, which should have priority. Also, since the effects of warming caused by CO_2 are different in each country, their targets may be different.

Even when we take up one cause of global warming, for example, automobiles, the sources of emissions are so many. In developed countries, there are maybe 10 million or so in each country. Even if we can focus on certain activities, such as the operation of automobiles, it is very difficult to develop measures that effectively control emissions from automobiles. This could be the direct result of factors that affect wide areas.

As for scientific uncertainty, I do not need to mention that because the long-term phenomena cover a wide range of areas, these two factors have an effect on scientific uncertainty. Even though scientists have tried to discover the real causes, it is very difficult to do so. Even if they do find them, still they do not know to what extent each cause has an effect on certain global environmental phenomena. Also, it is rather difficult to know how such measures can be effective in controlling such phenomena.

Even with modern advanced technical and social technology, it is difficult to know which technologies are more suitable for controlling such phenomena. Apart from this because of scientific uncertainty decision-makers may claim that on the basis of their own data it is shown that, for example, CO_2 issues will not be as serious as the IPCC has said. Actually, some U.S. industrialists claim that studies by scientists cannot be trusted. This may not happen in other areas, but the uncertainty of scientific knowledge gives rise to such issues.

At the same time, the uncertainty of technology development may cause some conflicts of opinion. Some say that to reduce CO_2, it is not a good idea to start reduction right now, but to wait another 10 years. By then, according to them, we may have innovative technology which can better control CO_2 emissions with much more efficiency. Some people say to wait until 2010. Some people, however, say that unless we start right now, we will be unable to control global warming. Because of scientific uncertainty, including technological uncertainty, it is very difficult for the decision-makers to persuade others of their insistence on certain policy measures. Therefore scientific uncertainty is one of the most serious issues that we face in decision making.

In addition to A), B), and C), global warming and forest diminution issues particularly have a direct impact on national and international economies. It is not an economic problem in only one sector of the industry; it affects the whole economy. The global warming phenomenon will have an effect on agricultural products, and may have some impacts on the health of the population. At the same time, efforts to try to control global warming may have a great impact on energy use in some countries, particularly in developed countries. So, global environmental issues are also economic issues, which makes the problems more difficult to solve. It is hard to reach a consensus, because some people prefer industrial growth to environmental protection. Effects of environmental degradation may appear in five or six decades, when we will no longer be alive. People look at the direct economic interests, and postpone decisions to protect the environment.

To sum up the difficulties in policy decision making for global warming issues, one is that there are too many policy alternatives. When we discuss policy decision making there are many alternatives. If all people were aiming for the same goal, it would not be difficult to choose one of the alternatives. But that brings up the second point, which is that there is a serious conflict of interests or values. Some people prefer environmental conservation; some ignore it. Still others prefer business interests. It is very difficult to reach a consensus on what kind of policy should be adopted. Even when there is a big conflict, if there is common objective, or persuasive or decisive criteria for choosing policy alternatives, then we could say, "This is much better than that." But in reality, since there is no decisive criteria to choose policy alternatives, opponents say, "We don't believe

that your goal is a good one. We have such and such policy alternatives. Why don't we follow this one?"

When it comes to global warming, this is a kind of battle among the gods. The gods have their own power and their own targets. So it is very difficult to choose priorities and policy alternatives because there are no objectives or decisive criteria for choosing policy measures. In other areas as well, it is not necessary for us to always have decisive criteria. But by and large, the situation there is much better than in global environmental issues.

With these in mind, I would like to talk about the international policy decision-making process. Particularly I would like to look at the CO_2 issue as addressed at the COP3 conference in Kyoto. Last month, Ambassador Tanabe, who was the Japanese delegate, published a book titled "Global Warming and Environmental Diplomats". I was a little surprised that he frankly mentioned all real names and countries in his book. Of course, it is good for us to know what is going on. He detailed what happened on December 10th and 11th. Unfortunately, at this stage, it is available only in Japanese, and the people who are most interested in this book are not Japanese. That is regrettable, but I hope that at some time this book will be translated.

I was a watcher from outside, I did not know what happened regarding CO_2 reduction at the COP3 conference. But even as an outsider, it was very clear that the whole process of decision making was concern with national interests of member countries. Of course, I do not need to mention that at this stage, the international community is just a collection of sovereign powers. There is no international government which can control all nations. Unless each country agrees, agreements cannot be enforced. So the whole process of COP3 is a fight among the developed countries with respect to their national interests, and a fight between developed and developing countries.

You probably know that at the beginning of the Kyoto conference, the European Union claimed that with the EU bubble a 15 percent reduction was possible. They not only claimed that they would reduce global warming gases and emissions by 15 percent, but that all other countries should also reduce global warming gases by 15 percent. They cited the unity of the countries in the European Union. And secondly, if only the EU reduces emissions, then it is an advantage for countries outside of the European Union. Through the final day, they insisted that these reduction rates should be applied to all countries. The United States, because of strong opposition from industry, did not say what its percent reduction goal would be.

Before COP3, ministries of the Japanese government got together to formulate a CO_2 reduction policy, and made use of an outside government forum, the so-called joint meeting of related councils, of which I was a member. There the government made it clear that by 2010, even if Japan increases the number of nuclear power plants by 20, we can only stabilize the CO_2 emissions. The reason for this is that by 1996, just before the Kyoto conference, emissions had increased by about 9 percent, 16 percent in transportation and civil life, and 2 percent in industry. The government calculated that in case this increasing trend remains the same, then by 2010 it should increase by 20 percent if no reduction measure is taken. When we compare the 1990 level, the government claims that by 2010, stabilization is the maximum effect even with all possible measures.

Since the Japanese government was the chair government of the Kyoto conference, it was not so brave as to say no reduction at all. They manipulated some figures and said they would make a five percent reduction. But with some modifying factors, Japan will reduce by about 2.5 percent. But still, the figure is 2.5 percent more than the government expected. For the whole 10 days in Kyoto, they discussed reduction rates, and the U.S. said that developing countries should be part of the reduction group. Even though they do not have the same duty as developed countries, the U.S. expected they should voluntarily participate in reduction.

In global environment issues, the most serious problem is that the variety of sources and activities are spread throughout the world. Even if one country or a few countries try to cope with global

warming, it will not affect the final result. No country wants to be the first runner, but rather a follower. Particularly, U.S. policy is very clear that if global warming gases should be decreased, that will affect the U.S. economy. Let the developing countries join together and someday the U.S. industry can compete with other developed countries, as well as developing countries. That is why the U.S. does not want to lead the negotiations.

This kind of national interest made the Kyoto conference very difficult. Finally, as you know, Japan made a commitment of 6 percent; the U.S., 7 percent; and the EU, 8 percent reduction. Their concern is not the reduction of global warming gases, to the extent that people in the 21st century can survive. Rather, they want to protect their national interests by minimizing the differences. The U.S. insisted that it could not have more than a 2 percent difference from the Japanese goal. Then the EU argued that in that case they could not take the original reduction goal of 15 percent, if Japan and the U.S. set their goals at 6 and 7 percent. This is not really scientific decision making, but rather very political decision making.

This account shows that to have desirable decision making for future generations, the negotiation process in Kyoto is not ideal. But there is still some hope for improving the situation. One is the IPCC finding in their first published report, not concerning social measures, but rather scientific predictions. Many people had some doubt as to whether the predictions were correct. The second report was published in 1995, and gradually the differences among the politicians have narrowed. The scientific uncertainty may not be solved completely, but it can be narrowed so that the base of the negotiations will be more productive.

Secondly, the activities of NGOs and of the general public affect the politicians making the decisions. For example, the EU selected a 15 percent reduction goal, but I do not think that EU politicians are willing to do that. However, they are pushed by public awareness and opinion to protect the environment and reduce emission gases. In Japan too, before COP3, the public did not voice their opinions. But toward the end of the negotiations, many newspapers and NGOs reacted to the slow process and development of the Kyoto conference. The Japanese government was pushed by public opinion, I believe. The efforts of natural science could improve the situation. Closer involvement of NGOs and the public could also improve the situation.

Thirdly, I believe that at this stage, social science did not play a great role in persuading politicians. For example, in Japan, when we discussed future policies after COP3, one of serious issues was environmental carbon tax. Industrialists said that the carbon tax may have a serious disadvantage for the Japanese economy, which is still now suffering from economic deficit. However no one knows how much the social cost of environmental tax would be, or how much the benefits would be. I know there are some studies and implementation of environmental accounting, but still it is not well developed. So I hope that my colleagues at this conference will make their best efforts to develop social scientific measures or ideas to cope with global environmental issues, and provide a basis for negotiations for politicians. IGES will also make an effort to develop those kind of social scientific measures for policy-makers.

I apologize that I do not have enough time to talk about national problems. But I hope that in the near future I will write an article on this issue. Actually, I have written about this issue in Japanese, but again, it is not available for you, so I will try to put something in English, hopefully, not too long from now. Thank you very much.

Invited comments on the talk of Professor Akio Morishima

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It is a pleasure to be here, Chair Elena Nikitina, friends and colleagues. I found Akio Morishima's presentation to be quite interesting and important. Dealing with the realm of scientific uncertainty, he illustrates for us many of the problems with decision making in an era of scientific uncertainty, particularly at the international level where there are multiple goals, and multiple values being sought. National interests may not always support efforts to bring a global commons into control. This is a topic of great concern to many of us. I have been serving on the U.S. Scientific Committee on Problems of the Environment (U.S. SCOPE). I would like to share with you some of our reflections that deal with this problem. Many of these were published in an article in *Science* recently, co-authored with Joanna Burger, Christopher Field, Richard Norgaard, and David Policansky. If some of you would like a reprint, I have put out a sign up sheet so that I can send the article to you.

Most of the theory and knowledge that we have of successful resource management, involves common-pool resources that are managed by groups living within a single country. Some of those range from very small to very large. These are resources that will continue to be important in the future. But some of the most difficult problems that we face in the future involve resources that are much harder to manage at the scale of a village, a large watershed, a region, or even a single country. Management of these resources depends upon the international institutions that are the topic of the discussion today.

Some of the experience in local and regional, successful management transfer to the global level. But global commons introduce new issues that we have not faced in the past. In our effort to try to understand these problems, we have made a sincere effort to separate out aspects of the resources being examined from governance and property rights systems. We need to keep our terminology straight. We refer to common-pool resources (CPRs) that share two characteristics. First, once they exist, it is hard to exclude people. No one can be excluded from the benefits of solving the problems of global warming. Second, one person's use detracts from the availability of the resource to others. When those two attributes are present, there can be dilemmas where individual self-interest leads individuals to ignore benefits that are produced for others, as Akio Morishima has well documented for us.

Solving these kinds of problems involve at least two elements. One is restricting access to a commons. A second involves assigning rights and duties, so that those with access have incentives to invest rather than destroy. Achieving both of these objectives efficiently and equitably is a very challenging task.

There are a variety of attributes of the resources that we are interested in that affect how difficult that task is. Some of those attributes include the size and carrying capacity of a resource. How measurable are the flow units coming from it? What is their temporal and spatial distribution? How much storage is there in the system? Are the resource units mobile, like fish? Or, are they stationary, like trees? How fast is the regeneration? How do various harvesting or emissions practices affect regeneration? All of these may have substantial scientific uncertainties, and thus

be the basis of considerable debate.

Given these very substantial differences, finding effective rules that match complex interactions and dynamics that are also perceived to be legitimate, fair and effective by those who participate, is a difficult and error-prone process, as we have heard. But despite problems, many users through the centuries have devised their own rules and sustained resources over long periods of time. Thus, learning how to allow parallel self-organized governance regimes to engage in extensive trial-and-error learning dramatically reduces the probability of disastrous errors for all resources in a region.

Whether there is a substantial capacity to solve CPR resource problems at the regional level, depends on the broader social setting in which these resources find themselves. National governments and international agreements can help or hinder local organizations. Higher levels can provide information; they can provide the arenas for discussion, for conflict resolution. But higher arenas can at times hinder local, regional, and national organizations by defending rights that lead to overuse, again as we have just been hearing. Or, they can squelch local and regional initiatives by maintaining that central authority has ultimate control over all resources, without actually monitoring and enforcing those rights, as we have seen in the case of many national forests around the world.

The lessons from studying local and regional CPRs are encouraging. Yet humanity now faces new challenges to establish global institutions to manage biodiversity, climate change, and other ecosystem services. These new challenges are especially difficult for at least the following reasons. First, the scaling up problem. Having larger numbers of participants in CPRs increases the difficulty of organizing, agreeing on rules, and enforcing them. We now have resources involving 6 billion inhabitants. Organization at local and national levels can help, but again, as we have heard, it can get in the way.

Secondly, cultural diversity challenges. Along with economic globalization we are in a period of reculturalization. Increasing cultural differentiation offers increased hope that the diversity of ways that peoples have organized themselves is sustained, and not quickly lost. And that new ways evolve at local levels. However, cultural diversity can decrease the likelihood of finding shared interests and shared understandings. The problem of cultural diversity is exacerbated by North-South conflicts.

Third, complications of interlinked CPRs. While the links between grasslands and forest management are complex, they are never so complex as trying to maintain biodiversity while at the same time coping with climate change. As we face global issues, we face greater interactions among global systems. But while we are more complexly interrelated, we are also more distant from each other, and from our environmental problems. As Professor Morishima has indicated, from our increasingly specialized understanding of particular points of view on the globe, it is sometimes difficult to comprehend the significance of global CPRs. We do need to work together to govern these resources successfully.

Another difficulty is the requirements of unanimous agreement in international treaties. The basic collective choice rule for global resource management is voluntary agreement to negotiated treaties. This allows some national governments to hold out for special privileges before they join with others to achieve regulation.

The last challenge is that we have only one globe with which to experiment. Historically, people could migrate to other resources if they made a major error in managing a local CPR. Today, we have much less leeway for mistakes. And there is no place to move, unless we start moving to rotating satellites, which I do not think is likely.

These new challenges clearly erode the confidence with which we can build from the past. And

yet the lessons from successful examples of commons management provide a starting point. We should not reject those lessons entirely. Some of those starting points are institutional. Learning how multilevel institutions operate at 5, 6 or 7 levels. Other lessons build from technology, such as increasing the accuracy of weather forecasts, etc. We may be able to build greater levels of trust as a result of better scientific management. In the end, building from the lessons of past successes will require communication, information, and trust that are broad and deep beyond precedent, but not beyond possibility.

A forum for discussing these issues is the International Association for the Study of Common Property. It will have a meeting in one year in Bloomington, Indiana, from May 31st to June 4th. One of the issues that will be involved in that meeting is the global commons. I have brought a call for papers, which is sitting over there are on the table. For those of you who may be interested in furthering these complex discussions, I hope we will see you there.

Thank you very much for giving me the opportunity to discuss some of these very complex issues with you today.

Discussion

Chair/Elena Nikitina:

I think we have time for a very brief discussion on these issues.

Questioner A:

Thank you very much, Madam Chairman. I listened to Professor Morishima's presentation and Dr. Ostrom's comments with great interest. I would just like to ask Professor Morishima about the evaluation of the transparency in national decision making leading up to COP3 in Japan. You stressed the importance of transparency in decision making. I understand that during the decision-making process leading up to COP3 in 1997, a joint council meeting was held which helped to integrate different ministerial policies and objectives to build a national consensus. But I am afraid that there were certain criticisms. At the last critical point of decision making, no information was provided to the public outside of what we call Kasumigaseki, the inter-ministerial closed circle. I wonder how you evaluate the transparency of that decision-making process. If you think that the transparency was not good enough, how do you think that it can be reconciled in the future?

The next question is related to Dr. Elinor's comments. It is the issue of integration or synergy between different global environmental issues, such as climate change and biodiversity. At present, for example, convention secretariats are separate. Scientific assessment panels, for example the IPCC for climate change, and another forum for biodiversity, are completely separate. National administrations are also secretly divided. There is no real communication or discussion between those people who are concerned with climate change and biodiversity. I think this is very important, because in reality climate change has impacts, as does biodiversity. They are all interrelated, but there is no synergy. I think there is more need for integration or synergy. I think that first of all scientific assessment should be done in a more integrated manner, where in the future, convention secretariat activities should be integrated. National administration should be conducted in a more holistic way. I wonder if you have any innovative ideas to rectify the present situation. Those are my questions. Thank you very much.

Akio Morishima:

I am not talking about the transparency of other governments, just the Japanese government. Frankly speaking, I think that in the process of the Kyoto conference, the transparency of the Japanese government was very bad, very much in the dark. And even though I said I was a member of the joint councils, and I represented the Central Council of the Environment, we were only given the results of the calculation made by the Ministry of International Trade and Industry and some of the other ministries. There were inter-ministry discussions, but that process has not been released even to the joint council members on the grounds that it was a diplomatic negotiation process. So diplomatic negotiation is solely in the hands of the government, not of outsiders.

Even though the public did not know what was going on in the Japanese government, they were able to get some information from outside. They pushed the government. Also, the Central Council of the Environment deliberated on some other aspects. We are prohibited to discuss those goals. Before the conference we were trying to decide what kind of reduction measures were available. That process has been made public; the deliberation was open to the public. Even the Central Council of the Environment did not have enough information from the government in general. But I think that gradually the attitude of the public has been changing, and the government lost its self-confidence because of the recent developments of government scandal. I hope that in

the very near future the government transparency will be a little bit improved.

When I participated in the conference, NGOs were represented in the U.S. delegation. In Japan, they were not, and they could not contribute to the government negotiations.

Elinor Ostrom:

Let me very briefly respond. Obviously you are pointing to one of though most difficult problems, as we are talking about both a carbon tax and carbon sequestration. The tax side has been the side where there has been the most work, even though as you point out sometimes the work on this has not really been brought into the negotiations.

There is an experiment going on in Costa Rica which I think is really quite interesting. They are experimenting with Norwegian funds in an effort to protect the national forest as a form of carbon sequestration. If that proves feasible, it may well be possible to devise extraordinarily complex institutional arrangements. They will have to be extraordinarily complex to sequester carbon in biodiverse flora. But right now, most of the discussion is thinking of plantations. If all carbon sequestration is plantations, then indeed we have an almost zero sum relationship between biodiversity and monoculture.

Chair:

Unfortunately, I will have to stop the questions at this point. But first, a very brief comment.

Questioner B

I found the two presentations very interesting but also quite striking in how little they had to do with most of the interesting papers that are being presented here that have to do with decision-making and the global environment. There is a sense that when we reflect as a community on the big question, we think that the question of decision-making in global environmental change is a question regarding global conventions, negotiation of binding rules and constraints. But when you look at what is going on in the trenches, that is very little of what is actually happening and affecting people's lives. One simple example would be all of the interesting work that is currently going on with El Niño. The decision-making is global environmental change but it is not in big global conventions and it is not in negotiation of binding rules. I think that we need to rethink what the big questions are and match them more effectively with what is really going on.

Elinor Ostrom:

I think you missed the import of the first half. I was obviously not articulate enough. The whole thrust was that there has been an incredible amount of local, regional and national experimentation, and that there is a lot to learn from it. It is not however perfectly possible to take all of those lessons and just scale up. So we have to learn from the past, and there is an immense amount of creativity and innovation going on that we need to learn from. But we can not just adopt the self-satisfied pose and say, "Well, we have coped before." This is because some of the problems that we are coping with are global in shape. They are truly different, and will require a different level of decision making. It is a good point.

Chair:

I would like to bring this session to a close. Thank you so much, everybody.

Plenary Talks

Session 5

Chair: Roberto Sánchez
(a member of ISPC of the 1999 Open Meeting)
University of California Santa Cruz (USA)

Speaker: Michael Redclift
King's College, London University (UK)

Commentator: Eduardo Viola
University of Brasilia (Brazil)

Conflict and the Environment; In Search of Legitimate Political Action

Michael Redclift

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Thank you very much for that introduction. I feel all the skeletons are out of the cupboard now! I was just going to say it is wonderful to see so many familiar faces, and so many distinguished faces here today.

I only have half-an-hour to do my presentation, which I will do with slides, so in the interest of brevity perhaps just say a little bit about the approach I want to take. My remit in this paper is to look at conflicts and the environment. It is obviously a huge, perhaps intractable, subject. What I am proposing to do is to concentrate on the origins and sources of conflicts over the environment. And I think that is something perhaps which not many papers have given attention to at the conference. The conference has been very much concerned with some of the practicalities of global environmental policy at the moment, but not with the origins of global environmental policy, as Roberto was saying: the kind of structural causes, and therefore the consequences of environmental problems and policies, the implications of history. I want in this Plenary address to prise beneath the surface, so to speak, and to examine the development process over the last 50 years, and its environmental implications.

The 'third world' apparently came into being in 1948, just after the last war, in an address by President Truman of the United States. The development process, globalisation and modernity are the outcome of much longer historical processes, however. I want to ask: How might we create greater security, human security, over the environment? In particular, what benefits might we derive from linking questions of livelihoods with wider international and global issues?

So perhaps we can begin with what is the common ground for most people at this meeting: which is the principles for securing international agreements. These principles for securing international agreements on global environmental change are usually understood in terms of the ratification of treaties, and international agreements at the global level. What I want to try and do is to focus on some of the processes that lie in the background, but which have influenced our capacity to reach any kind of agreement internationally.

Well, what are these principles? Well, I think the first one is that all countries and human societies are stakeholders in the problem and equally responsible for finding solutions. And that is a very easy principle to state, but I probably do not need to remind this audience that the practice is very far from that principle. That if we look at the ways in which environmental problems have impacted on human health today, it is not difficult to see that the principle of being equal stakeholders, and being equally responsible, is one that we have not yet realised. We have the much-quoted statistic about 13 million children under five dying annually because of water-borne disease, poor sanitation and poor nutrition. We have a whole series of other problems including problems like indoor air pollution: the burning of fires and stoves inside the home, which affects over a billion people in the world and which contributes to their ill health. We have a very poor quality of water, obviously, as I said, and we have enormous decisions being taken over the water supply that we have: whether

it should be diverted for irrigation, often for growing crops, or for direct human consumption. We have some major structural, distributive, issues at the heart of the environment. That is something that I hope we should not forget but which is easily forgotten over the years, because as we become familiar with the kind of rhetoric of environmental management that is so prevalent today, we tend to forget these processes.

So the second principle I think is about sustainable development. Sustainable development has been almost a code word for whatever you want it to be. Some of us who were interested in sustainable development a few years ago have lived with the knowledge that sustainable development is whatever people want it to be. It is something you can not be opposed to, but it is very unclear what people mean by it. Herman Daly has suggested sustainable development is an oxymoron and, of course, that lack of clarity is partly its very appeal. Some people in this audience may contest this convenient ambiguity and say 'yes, economic growth is necessary to sustainable development.' But my point is; where do we prioritise sustainable development in relation to economic growth? And in many ways, globally, I would want to argue that in the last few years, in practice, not in terms of our rhetoric, sustainable development has meant priority of economic growth over the environment.

So global environmental change carries implications for the management of the so-called 'global commons'; the big resources, or the collectively owned or collectively accessed resource, of the globe: forests, the oceans, the wetlands where conservation is in everyone's interests. And we're clear I think that the nature of the fragility and the vulnerability of these resources has drawn attention to the global management agenda, and perhaps been the source of most concern at the kinds of conflicts that arise.

So let's have a look at some of these conflicts over the environment. I have attempted just to sketch out a kind of blueprint, if you like. It seems to me that, analytically speaking, these conflicts fall into different groups. There are conflicts over development priorities: the distinction often being made between what is sometimes called 'poverty ecology' and 'wealth ecology'. 'Poverty ecology' refers to the kind of ecology or the environmental issues associated with poor people's livelihoods, of the reproduction of the household, of the reproduction of the means of subsistence and more. 'Wealth ecology' is the ecology that drives many of us in the North and for which we'd want to see bridges being built with the south. But it is sometimes depicted in rather different terms, in terms of externalities, or to internalise our externalities, in the jargon within technologies and so on. So 'wealth ecology' is the kind of agenda which is most important to the northern industrialised countries. And over global environmental *damage* there are conflicts. And that is the one distinction that we can point up, between what's being depicted as 'livelihood emissions' and 'lifestyle emissions'. We are talking about emissions of greenhouse gases. Do we equate methane from rice production from paddy fields, or ruminant animals with carbon from cars, from automobiles anywhere in the world? [Let's not forget that Mexico City has almost three million cars, so it is not a problem confined to the north, but much greater globally]. There are similar conflicts over natural resources, and here I am leaning on the kind of model that has been depicted, as many of you will be familiar, by Robert Goodland and Herman Daly. Their model is of the global ecosystem and global economic growth model pressing on that global ecosystem. So we have, on the one hand, the sourcing of current consumption and the consequences of that source of conflict. One of the concepts, or pieces of jargon, that is being developed to express this, which would be familiar, would be 'ecological footprints'. These are ways of actually trying to measure, in some form or other, the environmental impact of consumption, not just at one remove but at several removes, from where is occurs. These kinds of processes are increasingly important and they give content to the term 'global': conflicts over pollution and waste, conflicts over where we put the waste, what kinds of precautions we take, or are able to take, to minimise the effects of that waste over time. Also the kind of technologies, which I mentioned before, which seek to internalise environmental costs. I would not in any way want to undervalue the importance of what's usually

called, or sometimes called, 'ecological modernisation'. But that ability to internalise environmental costs within technologies, and within policies which reflect those technologies, also helps make countries adopting them much more competitive internationally.

Ecological modernisation does not add up to the sum of environmental solutions nor can it, in my view, answer the problems raised by most conflicts over the environment. They are partial answers to particular cases. They are increasingly important within the processes of industrial transformation. But there are many areas of conflict, and of contest, over the environment and over waste, which ecological modernisation cannot address. So I think we have to go back, we have to think a bit about what is happened in the last 50 years since the 'third world' was invented. Of course, there is not a 'third world' now. Certainly in London people still teach courses called the 'third world' and I ask where is this 'third world'? But we know what we mean when we talk about less developed countries. The debate around that is significant. From the perspective of the end of this millennia, the mid-twentieth century development decades, the years in which most of us have lived, look much more historically confined, much more contingent, than we had realised. We have regarded the decades in which we lived as 'givens', they are there so to speak: immutable and ubiquitous. This is what 'progress' has been like, if it is progress. This is what development has been like, we have lived through the last 50 years of the 'development decades'.

In fact many of the features of these last 50 years have been contingent. They have not been necessary, they have not been ones that were bound to continue. I think it is important to revisit some of these processes. First of all, cheap energy prices. There were in the 70's, as we know, substantial increases in fossil fuel prices which had their own impact. It gave rise to environment problems defined as problems around scarcity at that time. I think today's problems are largely defined around 'plenty' rather than scarcity. They are the costs of 'excess' rather than the cost of scarcity to some extent. But in the 1970's those issues and the long term effects of them were largely ignored. In that sense, they were 'underlying social commitments' or blind commitments as they are sometimes described. (Redclift, 1996) We worked with very cheap energy and the implications of it for the environment, for the ecological systems and so on, were obscure. We did not really know where they would take us. We have been part of what Richard Norgaard calls 'the hydrocarbon society' and that has been something we have not questioned.

Second, competition from cold war protagonists who supplied the South with military hardware, contributed to rising defence procurements. Now one can argue that this competition, cold war military competition, culminated in the Strategic Defence Initiative (SDI), which some people here may remember from the 1980's and which, among other things, contributed significantly to the eventual bankruptcy of the former Soviet Union. So the end of the cold war was linked to the escalation of military expenditures in the 'advanced' kind of military economies of Europe and North America.

Third, and by no means least, de-colonisation. I want to come back to this in a minute because de-colonisation, the effect of the disassembling of European empires, is of lasting significance to the environment which is often not fully appreciated. So these are three rather major trends, major processes that I would want to particularly emphasise. Development during the past century has also been about different modes of discourse, different ways of approaching the issues of modernity, growth and progress. I think it is very important that we do not forget these discourses. I have the impression, as some people have mentioned at the meeting so far, that it is been a unitary discourse, very much a prescriptive environmental managerialist kind of discourse. This prescriptive 'managerialist' approach has animated not all, but many, of the presentations and some of the discussion. And I think that this is an important discourse, it is a significant one, and it is probably the dominant one, certainly the dominant one today in the environmental field. But it is quite important I think to remember the different discourses which have been associated with 'development'.

First of all the idea of 'design' which is the one I have been referring to as 'managerialist'; the idea that we can replicate development, that there are valuable things within development that can be replicated, that can be engineered to some extent. It is in the history of the literature, which as most of you will know, goes back certainly to the 1960's. And actually as you become a bit longer in the tooth, you see the same issues, usually under different names, coming back again. The languages of development complete the circle. Development by design has been about our capacity to define and design a development, as if it were something we could put into place, in a kind of *transitive* way.

Second 'dissent', because development has also been a kind of ground for oppositional values. Marxists, neo-Marxists, various types of world system theory, fashions changed, ideas changed and more recently perhaps another development was also dissenting: eco-development, sustainable development. But 'development', the idea of development, has been contested. I am always reminded when I say this of something that Gustavo Estera, a Mexican economist, and activist always says: "in Mexico, development's a word that you mainly find in jokes." That was said some years ago, but there's a very serious intent to that remark and I think it does reflect this idea of dissent around development.

And third, development discourse is a link to an increasingly important field that we embrace today as post-modernism. Discourse analysis is about deconstruction. What is at stake socially and ideologically, in the *way* we discuss development? In how we understand it? So the idea of development as ethnocentric, as really representing one set of values within a multi-cultural, multi-value world and as teleological, as having some kind of in-build purpose has been subject to criticism. These things have been criticised and I have to say to some extent that I feel unhappy and uneasy about the extent to which some of the criticism, some of the deconstruction, of the development idea has recently tended to lead people away from engagement and practice, and away from some sort of commitment to changing the world you know. It has led some people towards sometimes a rather sort of gossamer-winged utopian view of academic discourse, as if the debates about the environment in particular can be conducted as if they were *purely* academic, *purely* analytical and not about people's livelihoods, practices, and intended to inform critical work on policy. So to some extent my deconstruction is not the same as my dissent and certainly not the same as my design.

So as historical events have been supplemented and, to some extent, replaced by others- we move into terrain that we are familiar with in the single concept of 'globalisation', which clearly represents a process of some description or processes, but also an *interpretation of those processes.* So when we talk about globalisation, we are not just talking about something that appears to be happening to the world but we are also talking in a very serious way about the way we interpret that happening, the way we interpret those events, those changes. Now 'globalisation' seems to me to be about increasing convergence, in economic development goals. The trajectory that is mapped out, with the possible exception of some radical green ideas today, is essentially the same trajectory. There are no alternative trajectories. The ways to get there are less contested than they were 20 years ago. So we have convergence since the neo-liberal ascendancy in economic ideas, and much that is followed or has been associated with it, in terms of policy. So perhaps convergence on objectives, but at the same time, much more competition in achieving them: so we have a world which is predicated around similar objectives in some ways, economically speaking anyway.

Second, there are problems in managing social and environmental impacts of global markets, a major issue. The issue of not only de-regulation but re-regulation around the environment, is the basis of a new kind of regulatory framework. How could it be put into place, put into practice and certainly how can it be put into practice at the global level? So the notions of regulation, de-regulation and of re-regulation of everything, from trade in goods, in environmental goods and in species and in emissions. And third, the increasing resistance to the *cultural homogeneity* of

globalisation. So in that sense globalisation is a paradox. It represents its own, or contains within itself its own, opposition: which is that people are seeking identities which are not homogeneous, which are not convergent, which are based on ethnicity, which are based on gender identities or other factors, perhaps generation identities or age identities.

Some of these changes, some of these reactions are obvious and perhaps I do not need to outline them too clearly. Islam is an example. The problems that Europe believed it faced in the late/mid-15th century are not so different from the ways that parts of Europe views the Islamic world today. I say 'views the Islamic world' rather than 'represents the Islamic world'. But Islam is clearly a pocket and point of resistance to some aspects of this culture of globalisation. Second, resistance to global homogenisation is illustrated by the Zapatistas, of Chiapas, Mexico: where peasant opposition to the government, as many of you know, got onto the Internet. Much of the activity, much of the support for the Zapatistas was drummed up through the ultimate global communication network.

Another example is in transitional economies, in the economies of the former Soviet Bloc . [It is a wonderful euphemism 'transitional economy' really because it rather makes my point about a convergent objective. I mean you're in transition to something and although we all agree about what that is, *where* you are in transition *to* is up for debate:] But there is resistance there, resistance we have seen to some extent in the issues surrounding Bosnia, Kosovo and the break-up of Yugoslavia and other areas of the former Soviet empire. This resistance is cultural, economic and political.

The second big issue is 'modernity' which is linked to globalisation and often not really clearly separated from it. But it seems to me anybody talking about the environment today and talking about conflicts of the environment has to grapple with the very difficult question of modernity. Now what does modernity mean? Again these are things familiar to you, but it may be useful to put them in context. Spatial and temporal shifts, communication with unknown individuals, communication in time/space. You know the anecdotes about people in restaurants all with mobile phones, all talking to their friends, and nobody in the restaurant talking to each other. Fortunately we have not seen much of that at this meeting, people have been talking to each other, but you do find during a railway journey, certainly in the UK, that people often spend all their time talking on phones to others and, of course, the impacts and effects of this are not going to be incidental. These are powerful forms of communication. So space and time shift through information technologies such as the internet, e-mail and satellite communication. These are changing the nature of communication. And certainly from the perspective of my generation, I would say, they are the single most important visible change that is occurred the last few decades.

The problem of agency and reflexivity is also a problem that sociologists and anthropologists and others, have spent some time on. But I think it is a wider issue: the question really of how much ownership people have if what is occurring, the extent to which the processes through which they understand it, and reflect upon it, and are able to criticise it. Reflexivity is part of modernity and increasingly modernity, as Giddens and others have pointed out becomes almost axiomatic, it becomes the thing that comes to define activity. And over the environment, we see this in the way that expert witness is contested, the way that expert advice over the environment, some of it provided by people in this room, is contested by people or by NGOs, by people on the ground. This is not necessarily contested in an active voluble sense, sometimes it is contested through simply not participating or not being involved. Reflexivity is a characteristic, an increasing characteristic I think, of modernity. So it comes back, this third point I mentioned, to the limitations of 'expert' knowledge. You know, if you replace local non-expert knowledge with expert knowledge, you get what has been termed the 'growth of ignorance'. The only thing that can grow is ignorance then because you are more ignorant in relation to the expert knowledge you are handed down and, in a sense, you could in a sceptical view, argue that development history had been about this

inadvertent commerce, the growth of ignorance. People's own knowledge and own epistemology is inappropriate or inadequate to the occasion. That is being contested under modernity. The implications for public trust underlie most of the environmental problems that have concerned us certainly in the north and many people globally, with origins in the south, have raised this question. How much authority has science, how much can we trust, what is the nature of risk, how much does combating risk imply the empowerment of the people?

So unanticipated global environmental problems have been inherited, largely, from the development decades. It seems to me there are many of these and we have been talking about some of these at the meeting. But one of the key ones is that we are now interested as much perhaps in global sinks as we are in sources. You know, 'the empty back pocket' of the global economy: what we are doing to the globe is often hidden, which carries enormous implications for the future. So not just in terms of carbon emissions but in terms of whole range of other forms of waste pollution and the capacity of the biosphere to absorb them. This is a key issue, a key issue in a way that was not always identifiable and a key issue in the sources of conflict 20 years ago. And as the new geo-politics of the environment develops: it is one based on different kinds of security, water security, climate politics, genetic politics. Maybe if people say we live in an un-politicised or de-politicised age, we are not looking for politics in the right places, maybe the politics will be a genetic politics or a climate politics. We have seen the beginnings of a climate politics, but I do not think it is developed very far. It will be interesting to see. So deregulation of markets increasingly conflicts with the internationalisation of environmental standards and technological responses to both. It is just a phrase, and perhaps a rather cramped one, but I am trying to express some of these contradictions, to some of these conflicts.

So what are the issues for the future then? Well, first of all, they are issues around governance and democracy. There is an increasing interest in what is sometimes called 'deliberative democracy' and I think this is a very important concern. I do not know whether we have reflected this sufficiently at the meeting. It is not just a question of focus groups although focus groups are a methodology and a valid one. Deliberative democracy really means identifying different ways of understanding governance and democracy; different discourses and the ways in which they might effect what is done politically. Does democracy, does political action, consist of voting for two candidates from two parties or does it involve some other sort of process much more grounded in everyday life and in the local community? So it seems to me, the interest today in deliberative democracy signals a real awakening and a significant one. I have always had problems with the word 'participation', since I went to a conference a few years ago and a women from Zimbabwe said she had problems with 'participation' because she did not participate in her own life. I thought this was a ringing phrase because participation, if you think about it, is always about *other* people's projects. It is not about its ownership. So in that sense, I think I would prefer other words but the idea of governance and democracy is central.

Accumulation, value and sustainability. These things are linked and how they are linked is important: can markets deliver both environmentally and socially sustainable development? And so here again we have conflicts over what is understood by these terms and these 'ends' and what we need to do to try and achieve them. And within modernity, can global systems of communication, media and consumption deliver locally legitimate knowledge? The sub-title I should say of my paper is 'In Search of Legitimacy' or 'Legitimate Political Action' so I am really looking at the links particularly there. How to have a legitimately local knowledge and make room for diverse practices. And that seems to me to be the inheritance, if you like, of the modernity question.

It seems to me that we have different spheres of environmental activity and risk and one way of identifying conflicts over the environment, is to precisely identify the kinds of spheres of production that we might be interested in, or the spheres of activity. The first one I have called the 'sphere of production' which is really about production, industrial sites and so on. The second, the 'sphere of

consumption' which is increasingly important and not just in the developed world. I mean the effects and the impacts of how we define ourselves and what we do through consumption become increasingly important. Their indirect effects, as well as direct effects, such as socially generated consumption, energy, waste. These are all very big issues. The third sphere is what I call the 'sphere of social capital and infrastructure. Both the built environment, the familiar human-made environment, but also the kind of spatial structures and services that go with it. These also carry distributive consequences. So if we are talking about conflicts over the environment, we are talking about conflicts in the way the physical infrastructure is developed and the groups whose needs it meets. And then finally, there is the 'sphere of nature.' Call it nature because this is not a human-made environment. Again we are familiar with many of the issues here, questions around amenity, who has access to nature or the countryside. In some countries it would be called 'countryside' but not in very many countries. But the whole issue of positional goods is important here: the value of resources or amenities that we want to go to see or experience is reduced by the fact that we are all going to see and experience them, access to wilderness, for example. Again one could argue that this is a northern issue, as animal rights, perhaps, is a more northern agenda, but it is certainly an important area of conflict around nature itself. And the 'sphere of physical sustainability', which I think has perhaps pre-occupied people here more than some of the others, is the single most important issue. I am thinking of the big, clearly global issues; climate change, ozone depletion, stability of coastlines, watershed basins, those kinds of physical problems associated with changes in our own 'getting and spending' to manage its effects and therefore with the need for environmental management.

So, that is it. I do not really have much to add. I think I have pretty much spent my 35 minutes and I am well aware that there are other people who want to speak and need to speak. So I think really I suppose I might sum it up, if I may, very briefly by saying that in looking at environmental conflict we need more than anything else to examine what the new basis of security might be. We need to know what the new basis is from which we build: the building blocks so to speak. So the idea of security in largely military terms, certainly is not relevant today but we need to focus on other issues I have talked about, and which remain the most important issues, such as water quality, of access to basic services and the depletion of those resources. These are the primary kinds of issues. So I think that we must not lose sight of that in talking about conflict and, at the same time, perhaps also reflect on the way in which changes like globalisation and modernity have tended to shift our understanding of events and some of the events themselves. Thank you.

Invited comments on the talk of Professor Michael Redclift

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Good Morning. Thanks very much for the introduction, Roberto. Well this is a very difficult task. I mean, Michael has presented a bright, broad and deep approach. Michael has been a genius in linking crucial issues of our world in just 40 minutes. It is even more difficult for me to react because I had to take notes almost in the darkness.

I would like to say that I mostly agree with Michael's presentation. I want to emphasize that at the core of Michael's presentation is the idea that conflict is strongly present in our society in relation to environmental issues. But it is present in a new way. I mean, the previous more linear way of social conflict has vanished and has been dramatically re-defined by the complexity of our society. I would also like to explicit some secondary disagreement with Michael's approach.

I think that there is not enough emphasis in Michael's presentation in the transformation of the world system from a national/international system to a transnational/global system. There is not enough recognition of the transnational redefinition of the arenas and players of social dynamic. In my view Globalization implies a historical rupture and not an incremental developing of previous world capitalism. Also, as Michael appointed, Globalization is far from producing homogenization. We are living more and more in a Segmented Globalization.

There is a movement from the international to the transnational/global system in international relations. The international system was state-centric. The transnational/global system is simultaneously state-centric and multi-centric: high diversity of social forces and actors, such as multi-national corporations, transnationalized NGOs, inter-governmental organizations and globalized issue-specific interest groups and media opinion-formers.

There is also a new dynamic in the microsocial-macrosocial relationship. Modern social theory associated the macrosocial with national society and the microsocial with the local level. With the intensification of the process of globalization, the macro-social has extended to encompass the world society, while there is a new intermediate mesosocial linked to the national level, and the microsocial remains associated with the local level. However the microsocial is deeply influenced by the macrosocial so that it is also globalized to varying degrees. Now, we have different profiles of globalized localities. There is also partial erosion of the Nation-State as the regulating center of social life and identity-definer/builder. At the same time, the complex asymmetrical interdependence between countries is increasing, sometimes reflected in the fragmentation of national societies.

Finally, there is partial erosion in national democratic systems because of the greater and more mobile financial power of market players, be they multi-national corporations, investment funds, and currency speculators. This is reflected in an increasing discrepancy between the territorial national-based system of representation and the transnational social forces-based system.

The consolidation of globalization in the 1990's differentiates the countries in three main types according to its insertion in the system: Developed, Emergent and Stagnant. Developed countries are based on knowledge-intensive production and services, strong attractiveness to investors and a high level of governance and per capita income. Emergent countries have economic dynamism

(or prospects therefor), medium per capita income and good medium-term potential for investors. Stagnated countries have low economic dynamism, low or medium incomes per capita, low attractiveness to investors and significant problems of governance.

As a consequence of globalization, national societies tend to become divided in three segments: the global, the national and the marginal. The first one is formed by individuals and organizations that have qualifications and productivity that enable them to compete globally: more than one half of the population in Developed countries, between one fourth and one tenth of the population in Emergent countries, less than five per cent of the population in Stagnated countries. The second segment is formed by individuals and organizations with restricted capabilities that are protected by political structures or geography from global competitiveness, and this is a transitory situation with tendency to disappear in the long term (from one half to one fourth of the population in Developed and Emergent countries, from one third to one tenth of the population in Stagnated countries). The third segment formed by a population that suffers increasing material and psychological deprivation: less than five per cent in Developed countries, from one fourth to one half of the population in Emergent countries, more than a half of the population in Stagnated countries.

The process of Globalization has dramatically redefined the cleavages and political alignments. The principal social-political forces are defined by its position in relation to globalization. Globalists have their interests and value systems shaped by the global scale. Nationalists have their interests and value systems shaped by the Nation-state and are against Globalization. Besides this central cleavage between Globalists and Nationalists it is also necessary to differentiate inside both forces according to considerations of support to social-political progressiveness and environmental sustainability. In doing the relevant differentiation and combinations we can consider the existence of five principal social forces: Conservative-globalists or Neo-liberals, Progressive-globalists or (just) Globalists, Sustainable-globalists or Greens, Nationalist and Radicals.

Neo-liberals defend national economies increasingly open to the world market, a central role for transnational corporations, the continuity of the non regulated expansion of financial markets, an accelerated expansion of the right of intellectual property, a small and selective disarmament, a freezing of the UN, the International Monetary Fund and the World Bank and an invigoration of the World Trade Organization. Neo-liberals have a value system according to which Markets come first, National Security comes second and Democracy comes in third place and (eventually) environmental protection comes in the fourth place. Examples of Neo-liberalism are: predominant sectors of Republicans and Democrats in the U.S.; Conservative parties in the E.U. and Japan; modern sectors of liberal parties in Russia, Eastern Europe and Latin America; and radical reformers inside/ outside the Chinese Communist Party.

Globalists defend national economies open to the world market, a central role for transnational corporations, the reform and invigoration of the IMF with a new mission of regulating global financial markets, a growing disarmament, a reform and invigoration of the U.N. - based upon the combination of the criteria of population size and economic power -, the invigoration of the World Trade Organization and the other International regimes. A significant part of Globalists support the Tobin tax which could raise $250 billion a year and would significantly calm volatile markets, while providing huge funds for fighting poverty. In a very relevant dynamic, Canada proved that a speculation tax is a realistic political goal when its parliament voted to support Tobin Tax, on April 1999, by a majority of two-to-one, attracting wide public support. Globalists have a value system according to which markets combined with democracy comes in first place, National Security comes in second place, and Environmental Sustainability comes in third place. Examples of Globalists are: sectors of the American Democratic Party; the social-democratic parties in the E.U. and Japan; modern sectors of the social-democratic parties in Latin America and Eastern Europe; modern sectors of the Congress Party in India; and, the underground opposition in China.

Greens consider non-viable the consumerist way of life and the polluting/inefficient productive systems and they advocate for deep reforms in the International order. Greens are defenders of environmentally sustainable and socially equitable development at the national and world scale. Greens support an active integration of national economies in the world market and subsidized transfers of sustainable technologies from Developed to Emergent and Stagnant countries. Greens strongly support the Tobin tax and the fast building up of Global Governance institutions combining principles of population size, economic power and environmental relevance. From a normative point of view the Greens defend a democratic road for construction global governance but they are willing to accept a more oligarchic path since it accelerates the process. Greens have a value system according to which Global Governance combined with environmental sustainability comes in first place, and democracy combined with markets comes in second place. Examples of Greens are: predominant sectors of the Green Parties in the E.U., Canada and Australia, minorities of the Green Parties in Brazil, Chile and Costa Rica; a minority sector of the European Social-democracy, the American Democrats and the Canadian New Democratic Party.

Nationalists defend protected national economies, powerful armed forces and a strong role for the Nation-State as the superior entity of the international order. The Nationalists are apprehensive of the transnational corporations and contrary the global circulation of financial capital. The Nationalists defend the freezing of the UN system and the undermining of the IMF, the WTO and other international regimes. A great variety of Nationalists exists, with different values and programs. According to the value systems of Nationalists, the National State and Security comes first, markets comes in second place varying a lot in its importance, and Democracy comes (eventually) in the third place. Examples of Nationalists are: the far right of the Republicans (USA), the National Front (France) and the North League (Italy); the Neo-communists (Russia and Eastern Europe); the traditional sectors of the left parties in Latin America; the conservatives of the Chinese Communist Party, the religious fundamentalists groups in the Islamic countries; the radical ethnic parties in the Balkans, and, sectors of the Hindi party in India.

Radicals defend sustainable development on a local and national scale commanded by a State that promotes social justice. The Radicals are against the WTO, transnational corporations, the IMF, global finance markets and international regimes. Radicals believe strongly in grass root organizations, radical pacifism, and reject globalization, consumerism and all mega structures. The value system of Radicals has at its top communities and local sustainability and in second place they value democracy and the state at the national level. Examples of the Radicals are: minority sectors of the Green Party in the E.U., Chile and Brazil; the bio-regional and deep ecology movements in North America, Australia and Scandinavia; minority sectors of the Workers Party in Brazil.

Three international regimes of high relevance for the global flow of matter, energy, people and information are in formation since the middle 1980's: the protection of the ozone layer, the climate change and the protection of the biodiversity. They are fully representative of the new dense interdependence between the biosphere and the world economy. The ozone regime is a clear example of a successful coalition between Globalists, Greens and Radicals. The impasses of the climate change regime are product of the hegemonic dispute inside the Green/Globalist coalition and its difficulties to cope with the veto coalition between Neo-liberals and Nationalist. The Biodiversity regime implies a diffuse victory of a wide coalition among Globalists, Greens and Radicals.

So these are my remark and it would be better if other people can also comment Michael lecture and we can have a wider base for discussions. Thank you very much.

Footnote: Professor Redclift has incorporated the discussion in his revision of the paper.

Plenary Talks

Session 6

Chair: Youba Sokona
(a member of ISPC of the 1999 Open Meeting)
Environnement et Development Programme Energy (Senegal)

Speaker: Leena Srivastava
Tata Energy Research Institute (India)

Commentator: Hans Opschoor
Institute of Social Studies (the Netherlands)

Valuation of Ecosystem Services: The Human dimensions of Climate Change in developing countries context

Leena Srivastava

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Thank you very much to the members of this conference and to IGES for giving me this opportunity to talk to all of you on this very challenging subject. The evaluation of ecosystems services is a huge and very complex subject area on which research has been going on for several years, but it is still very recent as compared to research in several other areas of work.

I am giving my talk on the specific focus of climate change and developing countries, but will necessarily review some of the work that has been going on in this area in the past as well.

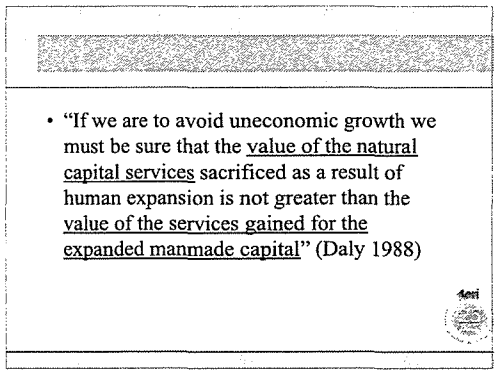

Figure 1

In his paper in 1988, Daly said, "If we are to avoid uneconomic growth, we must be sure that the value of the natural capital services sacrificed as a result of human expansion is not than greater than the value of the services gained for the expanded manmade capital." (Figure 1)

I think the important points are the ones that I have highlighted over here; the underlining is by me, not by the quote. I think what we read as avoiding uneconomic growth, should probably be read as avoiding unsustainable economic growth. I also think that we should recognize that the value of natural capital services is not still very well understood. There have been several attempts to place an economic value on various natural capital services that are provided to human beings in particular. But we do not yet have a complete fix on the entire range of the services. Portions of them have been valued in various studies.

The other part that I have underlined is to highlight the fact that this value of the natural capital services sacrificed should not be greater than the value of the services gained for the expanded manmade capital. And here again, I think implicit in the value of the services gained by the manmade capital is the fact that there is a certain value to the ecosystems services that we are exploiting which is built in to the value of the manmade capital services.

We can take an example from the sector of fishing. When a person puts in a certain number hours of work to go out and get the catch of fish that is being sold in the market, I think the price that that catch attracts reflects not only the labor value of the person who is putting in the effort to get the fish to the market, but also reflects the fact that this is a natural resource being exploited. Implicit in that is a value which is being assigned as a resource. The question that comes up is whether this value fully captures the value of that particular resource or not. That is where I think

the arguments do heat up.

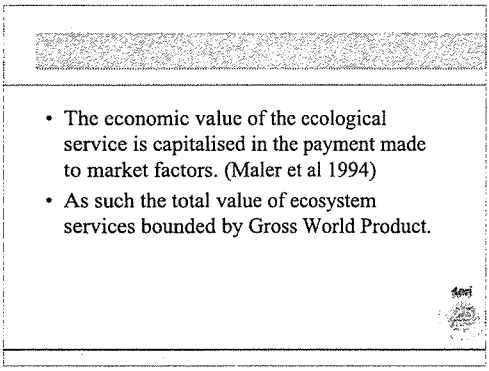

Figure 2

In his paper of 1994, Maler(Figure 2) made the argument that, "The economic value of the ecological service is capitalized in the payment made to market factors." Whether it is in the sense of fishing, as I just mentioned, or whether it is mining or other such natural resources exploitation-based activities, the argument that Maler made was that the value of these natural resources is capitalized in the payment made to market factors. By this contention I think he recognized that the total value of the ecosystems services is bound by the Gross World Product. The value of the ecosystems services under this assumption cannot exceed the value of the Gross World Product, because if that were to happen, then you would already be on an unsustainable path.

But I think that if you recognize the fact that ecosystem services are being threatened—that we are, on various stages and on various geographic scales, facing a problem of exploitation of ecosystems services beyond threshold limits—one would tend to say that the argument made by Maler et al. is not very correct. We are not as yet fully able to capture the value of natural services in this form of capitalization that he is referring to.

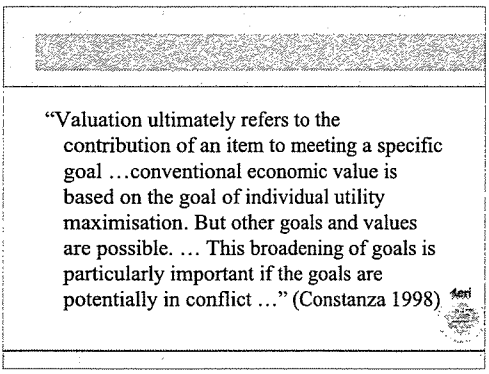

Figure 3

If you look at work that has been done by Constanza et al., one of the quotes that I would like to draw your attention to is that "Valuation ultimately refers to the contribution of an item to meeting a specific goal." (Figure 3) Normally, when you are talking about economics, the specific goal that we are talking about refers to " the goal of individual utility maximization." However, if we were to introduce other goals and values, which could be referring to various things such as sustainable development, social equity, or equitable development, and if we were to consider all of these other goals, then I think the valuation would come under conflict with this goal of individual utility maximization. I think that these areas then need to be recognized.

Constanza and others have also, in more recent studies during the mid 1990s, tried to place a value on the ecosystems services at a global level by aggregating results from various studies that have been done covering17 ecosystem services in 16 biomes in the world. They have arrived at an economic value of ecosystems services in the range of 16 to 54 trillion U.S. dollars. If you take an average of about 33 trillion dollars, that works out to 1.8 times the Global National Product which was produced in 1988. This obviously means that from a global ecological exploitation point of view, we are already on a very high path to unsustainable development. Secondly, if we want to correct the imbalance between the ecosystems services that we are utilizing and the manmade services that we are producing, we will have to increase Gross National Product by 1.8 times whci will exacerbate the ecological damage.

The literature on economic valuation of ecosystem services largely focuses on looking at the use value these ecosystem services and non-use values. This chart (Figure 4) in a sense represents the taxonomy of terms in the valuation of ecological services. Use value by itself is comprised of direct use values, indirect use values, and option values associated with a particular ecological service. The non-use values represent:

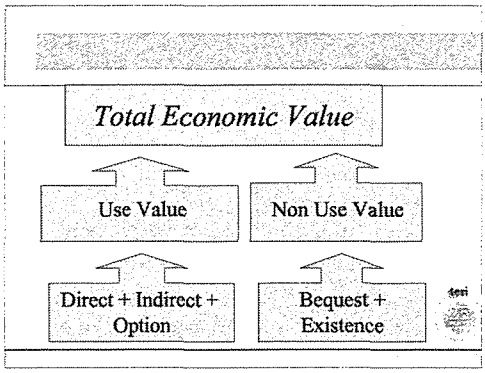

Figure 4

1) the bequest values, which in a sense are the value which you would assign to a resource to actually preserve it for future generations to use, or

2) the existence value, which is a value that you would assign for the sake of having the particular ecological service facilities available to you while not seeing any direct benefit coming out of the existence of this particular natural resource.

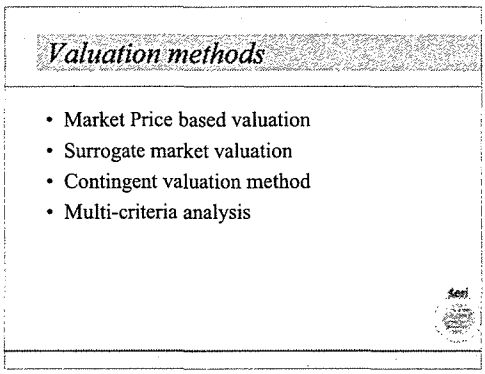

Figure 5

There are several valuation methods (Figure 5) that are utilized for arriving at this total economic value which is the sum of the use and the non-use values. You have market price based valuation techniques, which take direct market prices, or shadow prices in certain circumstances when one feels that there is no perfect market that exists, that there are imperfections in the market. Other methods that have been used include surrogate market valuation, where you essentially use the price of marketed goods to arrive at the value, or derive a value, for non marketed goods when there are relationships between the two.

You have the contingent valuation method, where you are creating hypothetical markets and trying to elicit values from the respondents of the survey that is carried out, a value that they are willing to pay for the services that are provided by either use value products or nonuse value products. Alternatively, it tries to estimate the willingness of the population to accept compensation for foregoing the use of a particular resource.

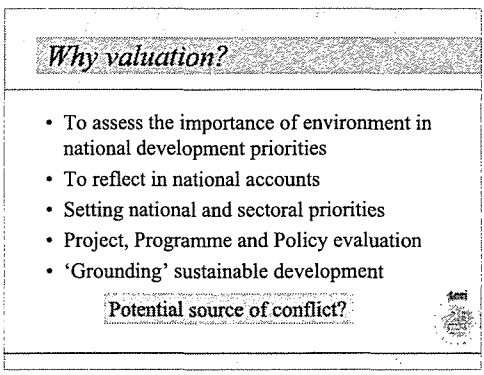

Figure 6

And of course, you have the multi-criteria analysis which is largely an ordinal ranking system and does not try to provide absolute values to the ecosystems that we are looking at.

Moving on from there to the question of "Why valuation?" (Figure 6). I started by saying that Daly said to avoid uneconomic growth, or to

avoid unsustainable growth. I think the valuation of ecosystems provides a means to ensure that we are not moving along on an unsustainable or uneconomic path. We would undertake valuation of these ecological systems and functions to:

1) assess the importance of the services provided by the environment in national development priorities;

2) to be able to integrate these into the gross national product, which measures only the economic functions that are taking place in the economy—and that too in the formal sector, not in the informal sector;

3) and to be able to correct for the signals that are going out to the rest of the population, the rest of the economy on the performance of a particular country.

We would use valuation for setting national and sectoral priorities once we have a *better* understanding, because I do not think that we are in a position as yet to have a *clear* understanding. Once we have a *better* understanding of what the cost of various sectoral activities are on the environment and other natural resources, we would be able to correct our developmental focus and reflect that in the priorities that are established. Valuation is also a very important tool that has been used for projects, programs, and policy valuation purposes, and for determining the effectiveness of the same vis-a-vis environment and other social factors. And I think that valuation is also very useful in a sense of grounding sustainable development, because sustainable development itself is a concept which is very amorphous. It depends on who is defining sustainable development for what period of time, and with what end objectives in mind. And I think that the process of valuation helps to define sustainable development in a wider context as well.

At the bottom of this slide, I have a question on whether valuation could possibly lead to or become a potential source of conflict. And the reason for asking this question is that valuation of the services that are provided by the different natural capital resources can bring out very clearly the implications of one set of activities on a thus far completely unrelated set of activities. So for example, if you are exploiting the forestry resources in the hilly regions of northern India, the implications downstream can be quite serious. A valuation exercise would highlight the costs borne by the downstream population so that upstream activities/populace may flourish. This can be a potential source of conflict, unless we are able to simultaneously internalize the implications arising out of the valuation exercise into the policy-making process. That is a question which I hope that some of you would be able to address.

An associated set of issues around the valuation of ecosystem services is the question of whose value is it that we are looking at? (Figure 7) There are, very obviously, intergenerational issues which are very prominent in placing a value on ecosystem services by virtue of the fact that the cost of the services can last you for a large number of years, over several generations. But, I think that the critical issue here is that the value that we would assign to ecosystem services is the value that we place on these ecosystem services today. The question that comes up is whether we are competent enough to place a value on behalf of the future generation on the resources that they are going to inherit from us. I think implicit in there also is a question of knowledge of the status of these resources that we are going to leave for the

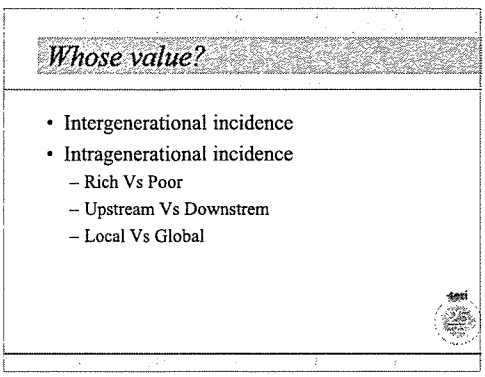

Figure 7

future generation, and then therefore the price that they would be willing to pay or accept.

The second set of issues relate to intragenerational equity issues. I think that again, questions of *whose* value become important. Are we to look at it from the richer segments of society's point of view, or the poorer segments of society? There have been several studies that have been done that point to the fact that, certain natural resources probably provided a much higher value by being where they are, in the uses that they are currently used for, rather than if these resources were exploited for alternative uses. There was a study done in Nigeria, for example, that showed that water resources in a particular watershed were yielding a factor of 5 higher value than the expected benefits from projects for which the water was being diverted. However, the project proponents obviously had a louder voice than the farmers who were using the water resources. I think here again, one needs to recognize the fact that while we may place a value on a natural resource, and make a decision on the basis of this value, there are inequalities in power structures and income levels that might influence the decision-making process.

The question of "whose value" also depends on your choice of the participants in the survey that you might be undertaking, whether these are upstream populations of the resource that you are talking about, or whether they are downstream populations. I think that here again you are likely to have differences in the value that is assigned to a particular resource. And I think that major differences can also arise, and conflicts can arise on whether you are looking at the values from the local population's point of view, or from a global point of view. The interests that are associated with a particular point of view can be varied depending on whether you are looking at local populations or global populations.

Then there are very specific issues which come up particularly in the context of developing countries in the valuation of ecological resources (Figure 8). The first point that I would like to draw your attention to, and with which many of you are probably already familiar, is the fact that the rates of discount provided by people in developing countries are going to be significantly higher than those in the developed countries. I think that a large part of this is because of the fact that populations in the developing countries are directly dependent on the natural resources for their very sustenance, for their very existence. Therefore, they will tend to assign very high rates of discount to the value that is provided by these ecological functions.

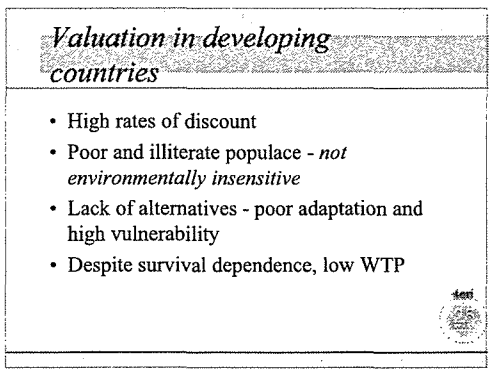

Figure 8

The second point that needs to be kept in mind is that populations in developing countries are poorer, and also illiterate, so they cannot completely understand the complexity of the functions that are being provided by specific ecological factors. But I think it would be wrong to say that these populations in developing countries are insensitive to environmental problems. At a local level, the illiterate are probably better aware of the values of the functions that are provided by some of the environmental factors. But, what they find difficult to do is to scale up the values of these functions to the global level and treat them accordingly.

You also need to recognize that in developing countries there is invariably a lack of alternatives. If you look at water, for example, and you are trying to value water resources in a developing country vis-a-vis a developed country, unless you very specifically build in quality considerations you are likely to get very erroneous results. When you talk about availability of water in the developed

countries, you are probably at the back of your mind presuming a reasonably good quality of water supply, where as in the developing countries you are talking about the very poor quality of water supply that you know exists. If you try to aggregate over this, and there have been some exercises where they have tried to do so, you are likely to arrive at some very erroneous results and conclusions that may lead to incorrect policies.

Alternatively, recognize the fact that adaptive capacity of people in the poorer parts of the world is very limited, and that they are highly vulnerable to the impacts of any variations in the resource endowments that they have, or for climate change, for that matter. Paradoxically, despite all of these factors, I think that the willingness to pay of populations in the developing countries is very much lower for the natural ecological services than what you would have in the developed countries. All of these factors contribute to this paradox.

In addition, I think there are other institutional and cultural factors that are also playing a very important role in this exercise. We were, for example, engaged in an exercise recently in India trying to estimate the willingness to pay of agricultural farmers for electricity, which is not a natural resource. It is a commodity which is man-made but, as most of you are probably aware, is normally made available free of cost to the farmers in most developing countries. Several interesting points came to light. Farmers were willing to pay a higher value for electricity provided that the same rate applied to farmers in neighbouring states. The pressures of competition, thus, have an important role to play in assigning a value to a resource. Then there are the cultural and historical factors wherein poor populations get habituated to having certain services provided. The expectation that it is the responsibility of the government to look after the natural resources, or to look after pollution in a particular city, etc. also affects the willingness to pay. Also you can see the impact of educational levels in a particular area.

I would like to highlight some of the complexities in this whole valuation of ecological services (Figure 9). If you define resources as "flow resources" and "stock resources", the trade-offs between upstream and downstream impacts might become clearer. If you look at water as an example of a flow resource, exploitation at the upstream level would mean deprivation at the downstream level. It also means that there would be a very high use value associated with water for the upstream consumers, but a high non-use value - by virtue of the fact that this resource is not available in the quantities desired - for the downstream consumers. If a more equitable access is provided to both upstream and downstream users, the use value would probably increase further on the upstream side due to reduced availability, but at the same time the nonuse value for downstream consumers would probably decline due to higher availability.

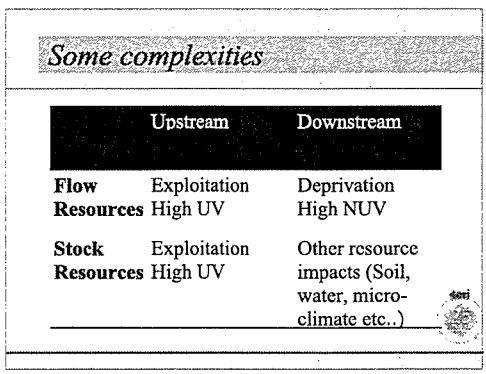

Figure 9

On the other hand, if you were to look at stock resources, like forests, exploitation at the upstream level or exploitation of the forest would have downstream implications on other resources, such as soil, water, the microclimate, etc. I think then that it becomes very important for us to be able to define the boundaries within which the valuation of ecosystem services are being undertaken, and appropriately assign values to the multitude of resources involved.

I think this chart (Figure 10) basically reflects the importance of having the right mix of respondents, particularly when you have a survey based valuation technique, and the need to capture all values

associated with various eco-system services. I think we also need to recognize that high income levels normally would result in low use values. I am making this point because I feel that the direct dependency levels on natural resources decreases with an increase in income. But the nonuse values, the existence values, the bequest values would go up. On the other hand, if you have high education levels then, for a particular resource, both the use and the nonuse values would probably go up. So again, I think we need to be very clear about the kinds of responses that we are aggregating to arrive at a total value for the resource or eco-system.

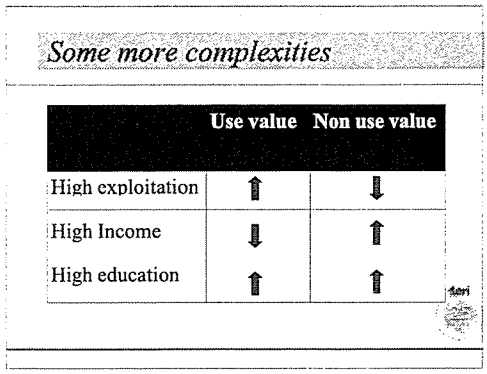

Figure 10

I would now like to move on to some general discussion on the valuation of ecosystems, very specifically to the climate change problem. The climate change problem brings out starkly both the intergenerational and the intragenerational incidences. The long lifetime of greenhouse gases in the atmosphere raises the issue of inter-generational equity. The climate change problem also highlights the pluralistic nature of the environmental problems and actually brings out the problems of aggregation across various environmental and natural resources. The impacts of global warming are seen in things such as temperature increases, changes in the precipitation patterns, and increased incidences of disasters such as cyclones, and storms, and so on. There is also an increased likelihood of the sea level rising. As such, the climate change problem highlights the pluralistic nature of impacts and magnifies the complexities of the valuation of ecological services, because then you are not just looking at one ecological service in isolation, but ideally you are looking at the interplay between the various ecological functions. You would then need to assign a value taking into account these interchanges. The climate change problem also obviously does not recognise geographical boundaries and raises the issue of aggregating values assigned to natural resources by diverse populations.

In trying to address the problem of climate change, there are several measures that are being talked about. Normally, we refer to mitigation measures that try to reduce the emission of greenhouse gases, or increase the sequestration of greenhouse gases. The chairman mentioned that I am a coordinating lead author on chapter 9 of working group 3 of the Third Assessment Report, which is looking at sector cost and ancillary benefits of mitigation measures. We have found from our survey of the literature that ancillary benefits, referred to in the title of the chapter, are a very difficult thing to place a value on. Several articles and reports talk about mitigation measures and the consequent environmental costs and benefits of changes in the level of pollution, of health impacts, etc. But there are very few studies that have actually been able to place a value on these.

In addition to mitigation measures and the impacts arising out of implementing these measures, there are also the impacts arising out of a potential change in the climate, and the need to assess the vulnerability of different eco-systems/populations. And in each of these, I think there is a potential scope for undertaking valuation exercises. Indeed, if we had a better fix on the value in each of these cases, the climate change debate would probably move forward much faster than what we have been seeing in the last several years. This is a major gap that we have in the literature that can well be addressed by a valuation of the ecosystem services.

Finally, I would like to close by saying that while the valuation of the ecosystem services is extremely useful, there is still a lot that we do not understand about it (Figure 11). If we are undertaking exercises to value the ecosystems resources, or the services provided by the natural capital, there is

need for caution on several accounts which I have mentioned during the course of my presentation. But just to sum up, I would reinforce the need to consider the geographical area where a resource is being valued, whose values are being accounted for, for what purposes are these values being assigned and the time dimension. The last because the values are not going to remain constant over time. Dynamic factors such as growing incomes, growing educational levels, resource scarcities etc will necessarily influence the values assigned to natural resources.

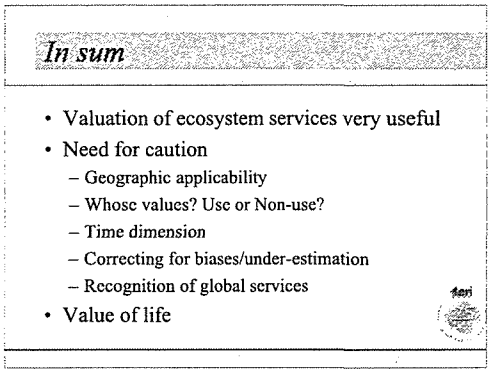

Figure 11

All the studies on resource valuation that have been reviewed as part of the preparation for this talk, have been undertaken in the last three to five years, which is not very long. These studies have shown that the total economic value of the natural resources has not really changed over time, except in those instances where there has been a direct increase in income.

This brings me to another point - the need for correcting for biases and for the danger of underestimating the value of ecosystem services. This is an important point. Underestimation arises particularly when you are undertaking valuation exercises in developing countries, because the responses that you would get from the populations in the developing countries are responses that are embedded in the context within which they are living. So for example, it is difficult to imagine a respondent from a developing country assigning a value to a resource, and indeed to his own life, beyond the particular income frame within which he exists. Such respondents are confined by a lack of knowledge on potential and opportunities. As such, there is a clear fear of there being an underestimation in the value that they may place on resources.

This leads up the last point that I would like to touch upon, which is on the value of life. This became a very controversial subject during the second assessment report process. If you ask a person in a developing country, what is the value that he would assign to his life, it would probably be some measly amount. But, my argument is that if you were to consider human beings as part of the total ecological resource, then the value of any human's life should really reflect the potential that human being holds for being able to contribute to the global economy if he had adequate access to knowledge resources. Therefore, the values that are assigned by the people who are well educated, who are literate, to the uneducated has to reflect this.

Finally, I think there has to be a recognition of the fact that the services that are being provided by the natural resources endowments that different countries have are global in nature. And the challenge here would be to be able to estimate the global willingness to pay for maintaining such resources, taking into account differences in the ability to pay.

Invited comments on the talk of Dr. Leena Srivastava

Hans Opschoor

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Let me start by presenting two examples of valuation of ecosystem services.

Somewhere in the beginning of the 17th century, Dutch sailors set foot in Mauritius where they found a bird called the Dodo. It is a pretty big bird. It did not really fly, so it was easy to catch. And what the Dutch did was to catch it and to eat it to the very last specimen of that species. Since then the Dodo is no longer with us. One could call that an example of high appreciation for a particular ecosystem service - but it was valued too low, due to a very high time preference (or discount rate): it is pretty stupid behavior, even if you look at the Dodo simply as a source of food. But one of the problems that I would like to highlight in my discussion is that one may not only wish to look at the Dodo as a source of food only. If you do value the Dodo beyond that, you may arrive at a totally different valuation of it, and consequently with totally different behavior towards it.

My second example is at the other extreme of values that people are putting on biological resources. If you have read Shakespeare you will recall Richard III, who at one stage in his career offered his entire kingdom for one single horse. That bid reflected a pretty high willingness to pay, I think. Of course Richard was motivated not so much by ecological reasons but by considerations having to do more with his own "sustainability".

Back to the questions that Dr. Srivastava put to us. One of the most important questions is why we should put a value on ecosystems and ecosystems services. I agree that it is important to attempt that, because in that way one might enhance the quality of the decision making of political and economic agents when they make decisions about their actions and about their strategies where ecosystems are concerned, including strategies about development policies. But as my examples showed: there are values and values, as much as there are valuations and valuations.

Economists have attempted to put values on ecosystems services by measuring the value of these services and systems in terms of *the intensity of human preferences* for them, actually reduced to what these entail in terms of *willingness to pay* for these services. In fact, in doing that economists put environmental services into their framework of cost-benefit analysis or applied welfare economics (a branch of mainstream economics). Economists find that to be some sort of high ground of rational decision making, as you may know. The assumption is, that in cases of scarcity efficiency considerations would suffice to at least arrive at a situation where the supply of a good is maximized. Apart from the fact that this claim would be true in cases of ecosystem services, one may wonder whether such efficiency considerations exhaust the full range of values relevant in this case - an issue to which I shall return.

But let us first consider how economists do what they want to do, i.e. what methodologies they apply. Dr. Srivastava has given a very thorough review of the field. I need not repeat that. Moreover, her paper presents ample references to empirical work in developing countries, on each of the methodologies that she has presented. It is a paper very much worth reading. I will try to take some of her points a bit further and explore some of the limits of valuation on an economic basis.

A first question is, which values should be taken into account. In the field of ethics a distinction is

made between *instrumental* values and *intrinsic* values of nature, biodiversity, species, etc. Economics may be good in picking up some aspects of instrumental values, I would argue, but it has been far less successful, nor can actually be, in capturing up intrinsic values. When a species becomes extinct like our Dodo we are indeed losing something of intrinsic value (its very existence) quite apart from also losing a source of food and perhaps other aspects instrumental to *Homo sapiens*. Those of us who would accept the existence of intrinsic values - which, incidentally, is not generally accepted - might have deep conflicts with economic evaluations. Economists have difficulties in handling such intrinsic aspects especially when they show up in the context of irreversible changes in ecosystems - as is the case with loss of biodiversity. Let me elaborate on these intrinsic values.

From an ecological perspective, one may discerns various functions that ecosystems may be said to perform towards human beings: regulatory functions, carrier functions, production functions, and information functions (De Groot 1992). And as we just saw, in economics one distinguishes the number of categories of value, use values, options values and existence values. There is no easy correspondence between those functions and values. One might say that economics, in its instrumental approach to ecosystems and ecosystems services, captures part of the production functions that ecosystems perform, but not necessarily very much of the regulatory functions, carrier functions, and information functions of ecosystems. So, in addition to the dialogue between ethics and economics there is one between ecologists and economists. Again, there is no easy correspondence between ecological functions and economic values and some of the reasons for that have been outlined by Dr. Srivastava. But let me dig a little deeper into the foundations of economic approaches to explain the divergence.

Basically, the mainstream of economics is based on foundations of methodological individualism and it takes a utilitarian approach to valuation. Both points of departure can be challenged from other paradigms and cultures. That, in fact, is one problem with the mainstream economic approach. Secondly, implicit and sometimes explicit in economic evaluations is the assumption that market behavior, and the result of that in the form of market prices, fully captures or reflects the relevant values or at least the largest part thereof. The generality of that assumption may also be questioned. Certainly this applies in those parts of the world where modern markets have not yet penetrated or do not dominate social behavior. So these are a couple of fundamental question marks in relation to economic valuation according to mainstream theory. And then there are the more operational difficulties as outlined by Dr. Srivastava.

That is not to say that I would argue that valuation is valueless. It is possible to identify a number of fields in environmental problem areas where valuation might be very useful, and inform decision making pretty adequately. That is, when the limits are not really in sight and where the existing methodologies are acceptable, economic valuation can play a role. In other areas, the economic approach to valuation, I would argue, should be limited and constrained. We have to take that into account.

Let me mention one or two examples of that. To begin with, in cases of environmental change where intergenerational issues and aspects are significant, I would have difficulty accepting economic approaches to values involved as the final answer to any question by decision-makers. Economists, or economics, are not so good at capturing intergenerational values. The only answer that we have in this discipline is answer based on the notion of 'overlapping generations'-based utility functions, but these do not take us very far. They do not really reflect the interest of future stakeholders. At best, they present what the current generation thinks their interests are. At worst, they fully ignore these interests, following the age old adagium: "Future generations have done nothing for me so why should I do anything for future generations?" So here we have one problem.

Another problem is that willingness to pay is actually constrained by income levels. That means that the values and price tags attached to natural resources, if they are valued according to the

mainstream approach, is very much dependent on the actual income situation, in terms of levels of income and - especially - distribution of income (Dr. Srivastava touched upon this as well).

A third problem is that of uncertainty due to lack of knowledge or information. Under such circumstances individual preferences (and sometimes even collective, public ones) are inadequate bases for the establishment of the value of ecosystems services: willingnesses to pay then are simply inadequately informed.

And, finally, let me refer to my comments above, on the inadequacy of economic tools in the face of irreversible change.

So, to summarize my view of this field, let me say that I am very much in sympathy with Dr. Srivastava's position. Some ecosystems services can be valued, at least partially, by economic means. Since my own dissertation in this field (in 1974) there has been a lot of progress, particularly in the area of methodology. But still, a number of rather fundamental issues remain. They have to do with the essence of economics, as I outlined. And I do not see how we economists can transcend those limits easily. That means that policymakers will normally be wise to not rely only solely on economic valuations of changes in ecosystems and biodiversity.

As Dr. Srivastava proposed, in the area of methodology, particularly when you are looking at developing countries, some steps ahead can still be made. Adding to the usefulness or the relevance of these studies, particularly by employing social ecological and participatory approaches to assessment and resource appraisal, can help a lot to overcome or bypass the difficulties of market assumptions that are very often implicit in standard methods.

That sums up, I think, where this field is at the moment. Environmental or ecological economics can answer some questions partially. It may be useful because it is very often capable of picking up a large part of the so-called externalities in the current generation. That is something that we can handle relatively easily. But it cannot pick up those intergenerational, intragenerational and interspecies problems that I have alluded to.

Reference:

Groot, R.S. de (1992). Functions of Nature. Wolters-Noordhoff, Amsterdam.

Opschoor J.B. (1998). "The Value of Ecosystems: Whose Values?". Ecological Economics Vol 25 No 1 (April 1998): 41-45

Discussion

Chair/ Youba Sokona:

We now have ten minutes for interaction and questions.

Questioner A:

Regarding the decisions that are faced in the developing countries. I agree though that when we speak about value then everybody will cease to be economists. Sometimes they say, "Okay, this could give us some answers." But I do agree that it has limitations especially because the externalities are too huge to deal with. Although I do not agree with the speaker when he says that the willingness to pay is also influenced by educational background, I completely agree with her when she says it is influenced by income.

There was some willingness to cooperate to surveys in Indonesia about air pollution last year. About 45 percent of our respondents have education levels below the junior high school. If we talk about global warming or dioxin contamination, they do not seem to understand. But if we use simple language, what I discovered is that people with low income do understand it and they do value it. I see no relation of their educational background to their willingness to pay or their willingness to accept. But it is low income is a constraint. That is my comment.

Chair:

Okay, let us take two or three questions and then a discussion can take place.

Questioner B:

On the point of India and the different countries as criteria for determining its value or the value that you would attach to natural resources. I use as a specific example cases where cultural dimensions of the problem very often make evaluation of the problem extremely difficult. Sacred landscape in one part of India was stripped and this virtually split society into two distinct halves. In such a situation, there is no methodology which I think will be able to ascribe a value to that particular natural resource. I do not want to go into the details.

And also, a very brief comment. Trying to assign a value to life, in my perception, is taking a Cartesian viewpoint of evaluation which may not be acceptable to a very large section of society. In particular, I refer to those who tend to look at life in the context of a holistic ecosystem process that is operating.

Chair:

One more. So, Leena. Can you comment on this?

Leena Srivastava:

Well, first let me start by thanking Hans for his comments and highlighting the fact that the regulatory functions of nature have not yet been fully captured. As he rightly pointed out, even the physical relationships are not completely understood. And we have been talking about placing a value which is several steps removed from there. That is definitely one major ecosystem function

that we have not been able to capture in value terms as yet. And I also agree with him completely when he says that with all of the evaluation exercises that we have undertaken so far, we still have incomplete answers. However, this is better than having no answers at all. I think we need to recognize the limits of our understanding of what the problem is now.

I partially agree with the speaker who said that he thought that willingness to pay is not influenced by education background. However, he went on to qualify himself by saying that it also depends on the nature of the environmental problem that one is talking about. Undoubtedly, the not-so-literate populace of the world would have a very good, if not a better, feel for the value of the resources that are at a local level and directly influences their lifestyle, than others who are far removed from the realities if we are talking about. But yes, if you expect the same set of people to understand the complexities of interactions that are taking place between various natural resources, that is a little difficult to expect.

The second commentator started by saying that he did not think that a distinction should be made in the valuation between developing and developed countries. But then he went ahead to say that there are cultural divisions and cultural factors that come into play, that influence values very differently in not only the developing and undeveloped countries, but in certain sets of these countries as well. So it is a very local phenomenon. But surely if you want to use valuation for purposes of decision making and influencing decision making, then valuations of the kind made by Robert Constanza and others will not be very useful.

On the value of life, of course I am not saying that we need to place a value on life, or that we can place a value on life. My comment was more on the principle of it. However, even when you are trying to assign or look at health impacts arising out of pollution levels or out of resource degradation, etc., there are morbidity and mortality issues involved. Somewhere you do need to be able to capture some of these values. The question is will you assign a different value to a person from India as compared to a person from Western Europe? That is where I think we get into contentious areas.

Chair:

Okay, Hans, please.

Hans Opschoor:

Leena left the contentious part to me, I am afraid: the issue of the valuation of life. I will try to say something about it.

In the first place, in response to the second comment, as an empirically-oriented economist, I simply observe that people and policymakers implicitly do value human life and in fact do put values on it. When decisions are made about road safety, about the level of activities in hospitals, medical budgets, etc., we are implicitly putting a value on marginal lives. That is enough for economists to conclude that apparently society does put values on human life. And they can elicit these values from the implicit shadow prices embedded in these decisions.

Another approach that economists have taken on this issue of the value of human life, is to look at how people individually were prepared to ensure against disease and death. Insurance premia can be regarded as the basis of individuals' willingnesses to pay for extending their life with one or two months, or whatever it is. Here again, economists in their observation of reality cannot but conclude that apparently people put a value on their own life.

Whether these different approaches (and other ones) to measuring the values people put on their

lives are consistent or not is a different matter. In fact, they are utterly inconsistent. Whether these observations on people's behaviour legitimizes economists in taking those values and putting them into their cost-benefit analysis is an altogether different question - basically a normative, ethical question. Once economists have derived some sort of value on human life in the case of one risk (say, road traffic), then policymakers or their cost-benefit analysts may say, "Well, let's use that price tag in cases of other risks to human life as well". Working in this vein, economists have been trying to calculate damages due to climate change. Tjios This is the context in which we are talking here. So let me quote from that part of the literature. In the context of IPCC assessments of the impacts of climate change there have been evaluations done of the damage due to greenhouse gas concentrations at levels twice the current levels. The outcomes of that, incidentally, show that most of the damage if you look at it globally will occur outside OECD, and less than 50 percent will occur within OECD countries. That in itself is an interesting conclusion. When you look into the calculations you will find something nasty that Leena already referred to, and she wanted me to say it apparently. If you look at the values that were put on human life in that particular study, it turns out that one person outside OECD is valued at one-third of a person inside OECD.

Now it is easy of course for any economist to correct those things if that was asked for. If you multiply the human life cost in developing countries by three, you have implicitly corrected this value bias. Incidentally, that would also show that even more than 60 percent all damage of climate change would occur in developing countries.

Another difficult factor when it comes to valuation of climate change is its impacts on biodiversity - which brings us back to the main topic of this session. That is very often left blank, or very partially approached. I think these are the two bones of contention. Basically, at least one can ask humans what they think the values of their lives are. Unfortunately one cannot ask specimen of other species what value they put on their lives. And that is our fundamental problem.

Chair:

Okay, thank you. I think that will end our session here. We have to think our two speakers. We now move to the parallel sessions.

Parallel Sessions

A total of 47 parallel sessions were held in eight rooms in Shonan Village Center and Lofos Shonan during the three days of the 99 Open Meeting. Each session comprised two to four presentations on recent research results, and 168 presentations were made in total. There was active discussion among the speakers and with the audience. Themes of the parallel sessions other than the five themes of the Plenary Sessions included: Industrial Transformation, Climate Change and Risk Management, Public Perception/ Attitudes/Behavior, Integrated Assessment, Vulnerability and Impact Assessment, El Niño, Institutionalizing Science in Global Environmental Policy, Carbon Management Post-Kyoto, Urbanization, Health, Business and Trade. Here are summaries of discussions in each session. The content of each presentation is provided in the Abstracts Volume: "ABSTRACTS 1999 OPEN MEETING OF THE HUMAN DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE RESEARCH COMMUNITY".

Session 1

1.1 Industrial Transformation: Indicators and Corporate Practices

Chair: Karl Steininger (Austria)
Rapporteur: Fridolin Krausmann (Austria) with the collaboration of Minoru Nakada (Japan) and Nadia Herb (the Netherlands)
Authors and Titles of Presentations:
Eric W. Welch, Midori Aoyagi-Usui and Sukehiro Gotoh (Japan): *"Environmentally significant consumption: Analysis of company behavior in Japan"*
Helga Weisz and Marina Fischer-Kowalski (Austria): *"Physical Dimensions of modernization: Beyond metabolism"*
Jacob Park (USA): *"Measuring business sustainability: Toward an integrated framework of social, environmental, and economic indicators"*

Key points of the discussion:

Following the presentation of three papers the audience and the panel discussed the following issues:

1. On the issue of scale and perspective the following questions were raised:
   * Can we talk of sustainability at the firm level? What does it mean?
   * Does the concept of sustainability vary with respect to perspective (company vs. consumer) or is it a stable concept?
   * Is there a correlation of environmental performance of companies and their financial performance? How is this correlation influenced by time scale? Is there a feedback from the stock market (stake of shareholders) on environmental benign firms?
2. The need to do comparative studies across countries concerning industrial transformation issues was raised in connection with all presentations in this session, in particular concerning the following:
   * In which way and to which extent does environmental performance and "sustainability of corporations" depend on the cultural and socioeconomic background of the surveyed country?
   * How do environmentally relevant consumption activities of companies differ across countries.
   * In which way do modes of "colonization" (social control of ecosystem processes) differ in industrialized countries and countries in transition?
   * Are there patterns of energy and resource efficiency in countries with different cultural background?
   * Societies in transition: How do traditional modes of subsistence interact with transformation processes?
3. With respect to indicators and data it was stated that:
   * Concentration on a small set of operationable indicators has high relevance (e.g. energy and material efficiency).
   * Expert panels are important in the formulation of sustainability criteria.
   * Validity of the concept of colonization should be based on the formulation of (comparable)

quantitative indicators for intensity of colonization.

* Empirical studies on the "risk spiral" are needed (i.e. the tendency of societies to take over more and more responsibilities concerning ecosystem processes (medical treatment, breeding, genetic engineering).

4. An open question:

* How can studies of environmentally relevant activities of companies (based on self-reflection) be linked to energy and material flow data? Can LCA be used a tool? (Problem of confidential data sets at company level).

1.2 Decision-making Processes: International Approaches

Chair: Stacy VanDeveer (USA)
Rapporteur: Sandra Rothenberg (USA)
Authors and Titles of Presentations:
Timothy O'Riordan and Andrew Jordan (UK): *"Institutions, climate change and cultural theory: Towards a common analytical framework"*
Eduardo Viola (Brazil): *"Brazil and the international politics of climate change"*
Yohei Harashima (Japan): *"Comparative study of the environmental policies in East Asian countries"*
Pascal Bader (Germany): *"Targets and strategies: The role of economic assessments in European climate policy"*

Key points of the discussion:

1. Regarding Dr. Harashima's paper-He found that countries that "lag" in the development of environmental regulation, there may be a "leapfrogging" effect. For example, it will take less time for lagging countries to learn about and develop technologies. But-it is much harder for these countries to "leapfrog" with regard to institutional organization. This takes much longer to learn about and implement change.

2. Mr. Jordan-The cultural theory, proposed by O'Riordan and Jordan is helpful for categorizing perceptions/viewpoints on environmental risk. It is not, however, well developed on an empirical level. In addition, because it does not take account of power, it is not a good theory for analyzing policy formation and implementation.

3. Prof. Viola-What looks like domestic issues are often in reality bound up with transnational forces. As example, the reducing support for ethonol in Brazil at first glance seems like a national issue. But, it was greatly influenced by changes in world oil markets.

4. Mr. Bader-Economic Assessments look at a range of policy mechanisms. They look not only at the economic impacts of market mechanisms, but also economic impacts of non-market based regulation. His study focused on economic assessments that analyzed the effects of regulations (among many other considerations) in the area of climate change.

Summary:

1. Harder to "leapfrog" in institutional and organizational areas verses technical ones.

2. What seem like national issues may be bound up with transnational issues and forces.

3. Cultural theory needs more empirical testing, but is helpful and accurate in identifying approaches to risk. It does not, however, include notions of power.

4. Economic assessments consider the impacts of a wide range of regulatory mechanisms.

5. When researching the influence of international forces on national environmental regulation-it is also important to consider how and if national activities influence these international forces. It may be a two way interaction.

1.3 Resources, Security and Adaptation

Chair: Steve Lonergan (Canada)
Rapporteur: Susan Hendy (Japan)
Authors and Titles of Presentations:
Michael Brklacich, Christopher Bryant, Ben Veenhof and Audric Beauchesne (Canada): *"Agricultural adaptation to climatic change: A comparative assessment of three types of farming in Central Canada"*
Richard Rockwell (USA): *"Actual and potential impacts of Environmental degradation on the world's growing cities"*
Marvin S. Soroos (USA): *"The atmosphere and human security: Reflections on the emergent international climate change regime"*
Hans. Petter. Wollebeck Toset and Nils Petter Gleditsh (Norway): *"Conflict and shared rivers"*

Key points of the discussion:

1. Continuing on from the research carried out on farmers in Ottawa, there should be extension work. Historical indexes should be looked at and applied to the farmer's opinions.

2. It would be beneficial if vulnerability was somehow incorporated, but there does not seem to be any room to incorporate it, which could be a weakness of the research.

3. Short term objectives versus long-term adaptation to vulnerability.

4. In cities, it is important to look at environmental justice, and the various causes. For examples, if poor people live in degraded areas, is it because they moved there because it was cheap, or did it degrade after they moved there?

5. Because of the heat generated in cities, will fewer people use public transport because their cars are better air-conditioned? While this is probably true, the US has for first time seen a downturn in greenhouse gas emissions, although there are still a lot of cars.

6. New cities are very important. If Asian cities use the same technology as Europe and the United States did, it will be an environmental disaster, and this is the major concern.

7. With regard to climate change and the Kyoto Protocol, mitigation and adaptation measures are both necessary.

8. There has been a "conspiracy of silence" about adaptation measures, because it is feared that they will ease the pressure on countries to ratify the Kyoto Protocol. However, adaptation will become inevitable, even though it will be very difficult.

9. With regard to conflict over shared rivers, it would be useful if water quality was taken into account, but the study will be a global one so it would be very difficult to take quality into

account as well. Furthermore, it would have to be a major pollution problem being carried downstream to cause a conflict.

10. Rivers as country borders are much more unreliable than land borders, which is a major reason for conflict.

1.4 Climate Change and Risk Management

Chair: James Risbey (USA)
Rapporteur: Mahendra Reddy (Fiji)
Authors and Titles of Presentations:
Angela Constable, Maurice D. Van Arsdol, Jr., Deirdre M. Mageean (USA): *"Risks from sea level rise in coastal California and Maine"*
Guofang Zhai and Saburo Ikeda (Japan): *"A transfrontier risk profile and multilateral risk management strategy in North-East Asia"*
Biman C. Prasad and Mahendra Reddy (Fiji): *"An investigation of the effects of property rights on coastal zones and socio-economic activities in the western region of Fiji"*
Robert J. Lempert, Michael E. Schlesinger, Steven C. Bankes and Natalia G. Andronova (USA): *"The impacts of climate variability on near-term policy choices and the value of information"*

Key points of the discussion

Topic 1: Angela Constable

1. How stakeholders perceive sea level rise

2. Primary concern of sea level rise is urbanization

3. Research in Coastal California (interviewed stakeholders)

4. Mitigation requires taking into account the concerns of local stakeholders.

5. Communities will not spend money on sea level rise, if they do not know what is going to happen.

6. Effects of Sea Level Rise

   1) Increased Urbanization

   2) Sea Level Rise will have serious negative impact on coastal population.

   3) Politicians interviewed sided with environmentalists to reduce development in coastal area.

   4) Some respondents wanted the use of tapes to protect coastal protection.

   5) Have to develop strategies that are cost effective.

   6) Without insurance and federal disaster relief, development in high risk zones will not take place.

Topic 2: Guofang Zhai

1. Sources of water distillation:

   -household

-industrial

-nature

2. Level of COD has increased from 1990 —>1994

3. COD in China and South Korea increased, in Russia and Japan decreased

4. Environmental risk increased greatly from 1990 to 1994.

5. Population in China and South Korea increased, in Russia and Japan decreased

6. Economy in China and South Korea increased, in Russia decreased

7. Japan and China had less RI (relative input) by technological innovation and management

8. Establish multilateral mechanisms for precautionary risk management.

9. Risk of TFP are increasing

10. South Korea has biggest COD

11. Economic development is key factor for environmental degradation.

Topic 3: Biman Prasad

1. Very little attention on how human resources affect Coastal Zone Management

2. Coastal Resources have played very important role on the development of coastal population and also an overall economic development.

3. Traditional systems of managing coastal resources may not be sustainable in longer run.

4. Common property and open access methods of resource extraction are sustainable.

5. Sustainable development bill in Fiji has flaws.

6. Industrial activities have led to significant coastal pollution

7. Tourism development has also led to degradation of coastal resources.

8. Conflicts could arise in Fiji, in future, if property rights issue is not solved.

Topic 4: Michael Schlesinger

1. Unless we are very certain about the state of world climate, adaptive strategy is best for abatement-better than prescriptive policies that preset the abatement profile.

2. Adaptive strategies are superior to prescriptive even in the face of large variability of climate.

3. There can be tradeoffs between the near term abatement strategies.

4. Adaptive strategies can be formulated that are nearly insensitive to the major uncertainties involved (climate sensitivity damage formulation).

1.5 Land Use and Land Cover Change: Multiscale Approaches

Chair: Ryosuke Shibasaki (Japan)
Rapporteur: Gergely Toth (Japan)
Authors and Titles of Presentations:
Peter H. Verburg, Tom Veldkamp, Kasper Kok, Free de Koning and Louise Fresco (the Netherlands): *"Integrated modelling of land use and land cover change with the CLUE modelling framework: applications in Asia"*
S. S. Sundarvel (India): *"Land use drivers and spatial scale dependence in Pondicherry region, India"*
Colin Polsky and W. Easterling (USA): *"Towards a multi-scale analysis of agricultural land-use change"*
William D. Solecki (USA): *"A framework for understanding the role of global-to-local linkages in environmental change"*

Key points of the discussion:

*Questions (Q) / Answers(A)

1. On Verburg's presentation

Q1: Concern about the scales that are used in the Java-case-study. While for China - or other country level studies - that resolution might be helpful, for relatively small areas - like Java - more detailed data would be necessary for acceptable results.

A1: The available data was for both China and Java case studies are available on a 20 X 20 km resolution, which corresponds to district level in Java. This data set was improved by using satellite images and also by using paper maps. I agree with the comment, however I think that the model is still relevant for the purpose of the study.

Q2: I would like to comment on the complexity of the model, which in my opinion should be simplified. In that way the methodology would also be more straitforward and the results more easy to interpret.

A2: Maybe in some of our case studies modifications can be applied, however these have to be carefully implemented, especially because the present framework is believed to provide adequate answers on the given scale.

Q3: How population influences the land use in China, especially with regard to the fact that different sections of population (also on a spatial distribution) have different socioeconomic behavior?

A3: I appreciate the relevant question. Socioeconomic development influences the diet of the population to a great extent, and this has significant impact on the land use. For the data we relied in earlier studies that have been carried out on the Chinese food demand issue.

Q4: Your combined analysis of the spatial variances was a little bit confusing for me -I am not quite familiar with the field you studied- can you please explain the use of the approach?

A4: My answer in short: To assess the competition among the different land use types. After the competition is understood, we can predict the direction to which land use conversion is going. Knowing the direction, we can predict the ways for achieving a possible balance on the longer run.

2. On Sundravel's presentation

Q1: Please explain, what kind of land capability model have you used for assessing the productivity of agricultural lands?

A1: We have applied quantitative land productivity analysis during our research. Results, however, show that the land capability did not significantly correlate with the changes of the land use structure.

Q2: In your presentation you have mentioned that both poverty and the farm size have a positive effect on the rate of the conversion of land to another type of land use. Could you explain these phenomena in a little more detail?

A2: You are right. With regard to the size of the property it was found that size matters in the land use change. There was a significant positive correlation between farm size and the rate of the land use conversion. This fact already indicates the importance of the land ownership structure. If we look at the poverty question, we see the tendency that with the increasing level of poverty, the land use conversion is also increasing. Marginal lands -that are more sensitive to degradation- are brought to cultivation, which will than result in decreased productivity and thus, increasing poverty. That fact illustrates one of the major problems. The population pressure represents the major threat to the land. With every 10 percent of population increase 4 percent of the cultivated land is lost in the area we have investigated.

Q3: Thank you for your valuable presentation. I would like to ask you if you could give any recommendation about how the land degradation can be reduced while also solving the poverty problem? I am very much interested in this issue, because I recognize many similarities between your findings and our research, which investigates these problems on the Ethiopian highlands. It seems that land degradation and poverty are generating each other, and it is extremely difficult to break this cycle.

A3: The most important tool to solve this problem is population control. Apart from that, the distribution of population is also very important factor in that issue. If population is more uniformly distributed, then the harm is smaller. However, it is no less difficult to implement measurements that will help in the optimization of population distribution.

Q4: What kind of data you used in your study?

A4: The data was on the level of household, and it consisted of social and biophysical subsets.

Q5: Have you investigated gender issues in your project?

A5: Although I agree that this might be a relevant consideration, so far we did not do studies in that context.

Q6: What connections did you find between the social variables, the land size distribution and per capita land unit?

A6: They intercorrelate. We have to go to factor analysis to see more details.

Q7: I would like to ask if I correctly understood from the presentation that land cover is not changing, but land use is changing, is that so?

A7: *Yes,you are right.*

3. On Polsky's presentation

Q1: Can you please give some examples of the variables that are included in the regression on the country level?

A1: We have included indicators of soil quality, population, market distance etc., but we did not go too deep in the analysis. At the first approach we only investigated the factors included to weight them: this is the task for future research.

Q2: How often can you conduct interviews and is the data earned from interviews adequate for the goals of the research?

A2: To address your second question first: the representativeness of the data is attainable by applying similar techniques with those in usual opinion polling. We followed the literature for the design of the interviews. The frequency issue is more difficult to address, and it is

associated with complex social matters on the household level. We try to find techniques to overcome these problems.

Q3: From Japanese experience we can assume that the land value has an effect on the distribution of the land cover and thus the change in the land use, can you please comment on that from your experience?

A3: We will look on the land value in the time with spatial variation in our next step of the research. We have the data available from the beginning of the century, and from the first such general census in the 70's to the present in a greater detail.

Q4: My question is rather practical: what computation techniques you are using to carry out your analysis?

A4: The software we use is widely applied in the social science community for hierarchical analysis. However to my knowledge it is first applied for the purpose of land use changes analyses.

4. On Solecki's presentation

Q1: I would like to address the complexity issue associated with the re-study of the Everglades. How do you plan to overcome the difficulties?

A1: Local groups are playing an important role on assessing the attainable scope of the restudy. We also rely on them when interpreting the findings, which are indeed very complex by nature.

Q2: On different levels different partners form the coalitions. How can you express these phenomena in your study?

A2: It is very difficult to detect and describe the roles of the coalitions (and their structure) over time.

Q3: Can you please comment on the effect of globalization on the agricultural sector and environment?

A3: The agriculture is somewhat artificial in the region and it is mainly due to the restriction put on Cuban sugar import. The other sector is the vegetable sector (that produces vegetables for the northern market) and it is a very fragile economy. With the NAFTA we can see a quick change in the land use system, which might be helping the environmental progress in Florida, but shifting the problems to Mexico. Therefore on a global level, the problems remain, or even increase. Especially because like in Mexico, now marginal lands are cultivated as well, which are more sensitive to degradation. We would need to give more consideration to these issues both in scientific research and when implementing policy measurements.

1.6 Public Perceptions of Global Environmental Change: Cross-National Comparisons

Chair: Paul Stern (USA)
Rapporteur: Caitlin Simpson (USA)
Authors and Titles of Presentations:
Jon A. Krosnick, Penny S. Visser and Allyson L. Holbrook (USA): *"American public opininon on global warming: The impact of the Fall 1997 debate"*
Peter Ester, Henk Vinken (the Netherlands) and Midori Aoyagi-Usui (Japan): *"Global environmental attitudes: A comparison of results from the Netherlands and Japan"*
Solange Simoes (Brazil): *"Global environmental survey: Brazilian results"*
Midori Aoyagi-Usui and Atsuko Kuribayashi (Japan): *"Global environmental survey: East Asian results"*

Key points of the discussion:

1. In the United States, a large increase in media information following a White House conference on global warming did not lead to a change in public opinion at the surface. However, opinions did become more polarized along political party lines. In terms of the global environmental survey conducted in Brazil, those interviewed were allowed expanded discussion of the more complex issues/questions in the survey. It is believed that policy makers do not make extensive use of scientific information with the exception perhaps of information from environmental experts.

2. In comparing perceptions of the environment between Japan and the Netherlands, some values, such as living in harmony with nature, are universal. However, the perception by individuals of their ability to influence the broader system and the environment differs between the two countries. Moreover, in western countries, environmental issues are linked with altruism; whereas, environmental values are generally linked with tradition in Japan.

1.7 Sustainable Development

Chair: Youba Sokona (Senegal)
Rapporteur: Angela Colthorpe (Japan)
Authors and Titles of Presentations:
Anna-Lisa Linden and Annika Carlsson-Kanyama (Sweden): *"Travel patterns and environmental effects now and in the future: Implications of difference in energy consumption among socio-economic groups"*
Li-chun Chen (Japan): *"The environmental issues with industrialization, urbanization and energy consumption in Taiwan"*
Sylvia Karlsson (Sweden): *"Problem structuring and policy matrixes-Layers of institutional approaches to pesticide use in the South"*
Fumiaki Toudou and Hiroki Nogami (Japan): *"Intergenerational social choice and discount rate in environmental resource use: From the viewpoint of justice and individual decision"*

Key points of the discussion:

1. The determining factors for the level of sustainable travel patterns were based on the Kyoto protocol - CO_2 emissions.

2. Due to a higher income the travelling distances of individuals increase.

3. NGO's are of utmost importance in Taiwan in the way in which the environmental performance of industries has been affected. There are as yet no formal organizations in practice to combat the problem.

4. Heavy industries have moved out from the cities and are based in the periphery similar to Japan's economic growth process.

5. The value per capita of energy consumption is decreasing.

6. In Europe there is a drive to promote ecologically grown coffee on the market. In Kenya coffee was introduced into the market at the same time as pesticides, which has created an absence of alternative technologies. The NGO's in Kenya are however willing to introduce the organic movement to the market.

7. In the rich Southern Countries eg. Kenya, Costa Rica, agriculture is export orientated and therefore pesticides are considered essential to their production, whereas this may not be the case in other poorer African countries.

8. The present European demands for lower levels of pesticide use is a major influencing factor to change the pattern of use. There is a lack of data for domestic food crops which is a concern for the future.

9. There is difficulty thinking about the cooperation of future generations. However there is always an overlap of generations and taking this into account social security systems are built. In industrialized countries the social security system is externalized whereas in developing countries it is internalized. A breakdown in the social security system of the industrialized nations has taken place due to the management of benefits and funding and the "pay as you go" pension scheme.

1.8 Integrated Assessment/Integrated Regional Assessment

Chair: Joseph Alcamo (Germany)
Rapporteur: Joseph Alcamo (Germany) with the collaboration of Naoko Miyazaki (Japan)
Authors and Titles of Presentations:
Marjolein van Asselt (the Netherlands): *"Uncertainty at risk: Learning from the Dutch environmental assessments"*
Yongyuan Yin, Suoquan Zhou, Qilong Miao and Guangsheng Tian (Canada/China): *"An integrated assessment: Climate change, land use and regional sustainability in the Yangtze River delta of China"*
C. Gregory Knight, David G. Abler, Eric J. Barron, Jeffrey Carmichael, Heejun Chang, Robert G. Crane, Mary Easterling, William E. Easterling, Ann N. Fisher, Amy K. Glasmeier, Patricia Kocagil, Steve Lachman, Stephen A. Matthews, Adam Rose, James S. Shortle and Brent Yarnal (USA): *"A framework for integrated regional assessment of global climate change"*
Christoph Schlumpf and Claudia Pahl-Wostl (Switzerland): *"A new approach in computer modeling for participatory integrated assessment: A case study of climate change in Alpine regions"*

Key points of the discussion:

Topic 1: Involving citizens and stakeholders in integrated assessment

It is worthwhile to involve citizens and stakeholders in integrated assessment because:

1. Analysts carrying out integrated assessments can gain much informal knowledge from the citizens that will improve the integrated assessment.

2. Involving these citizens provides an opportunity to communicate the results of the integrated assessment to a broader audience.

However, it is extremely difficult to include "average" citizens in global assessments without additional financial resources and time. On the other hand, it is very feasible to involve them when the integrated assessment is of a local scale.

Topic 2: The role of models in integrated assessment

Models can play an important role in integrated assessments by providing quantitative information and by helping to maintain the consistency of assumptions and results. However, many stakeholders and users of integrated assessment find it difficult to understand how models work. Another limitation of models is that they often do not include important qualitative knowledge that is relevant to the integrated assessment.

A solution to this problem is being worked out now in two large international projects: (i) the IPCC *Writing Team of the "Special Report on Emission Scenarios", and (ii) the Scenario Panel of the* World Water Commission. These two groups are using a new approach which combines qualitative scenarios with quantitative model calculations. This approach has two components: (1) developing qualitative scenarios or "storylines" that integrate a large and varied amount of qualitative knowledge and (2) using models to check the consistency of the qualitative scenarios, and to provide quantitative information for the scenarios. In an iterative process, the qualitative scenarios are used to derive inputs for models, and model results are then used to revise the qualitative scenarios. The result is a scenario or scenarios having a rich mixture of qualitative and quantitative aspects.

Summary of discussion

1. Integrated assessment first began in the 1980s with applications to the global and continental scale. Results presented in this session showed that this approach can also be successfully applied to the regional and local scales. At this scale it also becomes easier to involve citizens and stakeholders in the assessment.

2. Also in the 1980s there was an intense interest in the uncertainties of estimates from integrated assessments and models. These interests subsided because researchers encountered many methodological difficulties when they tried to identify and quantify uncertainties. Now there is a revival in interest in uncertainty, and new methods may help to overcome the earlier methodological difficulties.

Session 2

2.1 Industrial Transformation: The Energy Sector

Chair: Eric W. Welch (Japan)
Rapporteur: Ashish Rana (Japan)
Authors and Titles of Presentations:
Neil Strachan and Hadi Dowlatabadi (USA): *"Deregulation of energy markets and diffusion of efficient technologies: UK engine cogeneration"*
Toru Matsumoto and Hidefumi Imura (Japan): *"Foreign-affiliated firms and environmental problems in China: Environmental implications of foreign direct investment"*
Tae Yong Jung and Tae Sik Park (Korea): *"A study on structural changes of manufacturing sector in Korea: The measurement of real energy intensity and CO_2 emission"*
Pradeep K. Dadhich (India): *"Industrial transformation and energy: An Asian perspective"*

Key points of the discussion:

1. The four presentations during this session covered four different regions - the UK, China, Korea, and Asia. The strong presence of developing countries probably reflects the kind of concerns and transformations in energy sector in these regions.

2. The opening presentation by Alex Farrell was the paper by Strachan and Dowlatabadi "Deregulation of Energy Markets and Diffusion of Efficient Technologies". This paper focuses on use of Engine Cogeneration technology in UK. The paper presents a detailed analysis for 600 installations. The first part calculates the Minimum Size Threshold (MST) in a probabilistic analysis. MST is that size of installations for which the probability of net present value being positive is 0.5. The next part of analysis concludes that fixed maintenance costs are the key determinants of MST and driving them down is most important. The paper also presents a comparative analysis of firms in this market and analysis shows that large size of installations becomes the winning factor for a firm to become market leader over time. The speaker ended with making a case for paying attention to supply-side issues for promotion of such efficient technologies. The presentation aroused a lot of interest with the audience. During discussion time, Mr. Anoop Singh feared that price of natural gas has fallen more rapidly than price of electricity and this might be a factor affecting penetration of this technology. The speaker said that it was difficult to take the price data. To the query of Mr. Olaf Unteroberdoerster about discount rate for calculation of net present value, the speaker clarified that a rate of 15%, arrived at after doing a sensitivity analysis, was used for the final analysis. Another comment from Mr. Unteroberdoerster was that deregulation might have driven down the energy price itself to which the speaker had no comment. Final comment on the presentation by Mr. Pier Vellinga was that similar programs were undertaken in other European countries. And in case of the Netherlands "institutional factors" were important for breakthrough of such technologies.

3. The second presentation by Toru Matsumoto was on environmental implications of foreign direct investment and foreign affiliated companies in China. The paper mainly focuses on change in industrial setting and effect on energy consumption in China's manufacturing sector. The presentation was well taken by the audience and elicited a few comments. Mr. Vellinga expressed his concern that largely the reduction in energy intensity is caused because of use of state of the

art technology therefore a comparative analysis of foreign investment in China versus domestic investment in other countries might throw a light on this factor. To this the speaker showed clearly that energy intensity reduction in developed countries that were the main source of foreign investment in China was not as much in othercountries as in China. Mr. Singh commented that there was a large new investment in the power sector in China in the past few years and energy intensity reduction may be partially explained by it. The speaker responded that the study of investment in infrastructure cannot be handled by the same methodology and his study focuses only on manufacturing sector.

4. The next presentation was by Tae Yong Jung about structural changes of manufacturing sector in Korea and measurement of real energy intensity. This paper splits the conventional index of energy intensity, that is energy use per unit of value added. The idea is to sort out the 'noise' of structural change from the aggregate index of energy intensity. The speaker presented a very succinct picture of energy intensity in Korean manufacturing sector. Mr. Jacob Park's question pertained to specific mention of semi-conductor industry being very low energy intensive compared to basic industry like steel. His concern was towards the other environmental impacts of semi-conductor such as use of water and production of greenhouse gases other than carbon dioxide. To this the speaker responded that the environmental costs have not been internalized. Mr. Singh commented on the conclusion of Dr. Jung that carbon intensity reduction was largely attributed to the fuel substitution. He said that the fuel substitution in electricity sector would show more decline. Dr. Jung responded that only one company was a large player in the market and fuel mix change in that was taken into consideration. Other players were relatively small to affect the result.

5. The last presentation by Mr. Pradeep Dhadhich was on Industrial transformation and energy from an Asian perspective. His paper throws light on the complexity of multiple concerns in energy sector throughout the Asian region. On a comment on the future of centralized versus decentralized energy production in Asian region, Mr. Dhadhich said that the Indian experience with both types of systems shows that decentralized production is good for hydro and biomass but there are many barriers to be overcome and implementation issues to be sorted out. He emphasized that through institutional and governmental support the gap can be narrowed.

6. At the end the forum was thrown open for any questions or comments by the Chair. Mr. Singh opined the use of Engine cogeneration, discussed in the first presentation, for India. Mr. Dadhich thought that in India this option seemed difficult since engine cogeneration would require use of oil, which puts pressure on demand for foreign exchange.

2.2 Decision-making Processes: Participatory Approaches

Chair: Heather Voisey (UK)
Rapporteur: Andrew James Jordan (UK)
Authors and Titles of Presentations:
Alfred Endres and Cornelia Ohl (Germany): *"A new criterion to evaluate environmental policy measures in the international context to limit global environmental risks: the cooperative push"*
Brent Yarnal, Robert O'Connor, Richard Bord, Ann Fisher, Christopher Reenock, Robin Shudak, Peter Pascale, Mary L. Glassberg and Rob Neff (USA): *"The response of community water systems managers to climate variation and change: A case study in Pennsylvania's Susquehanna River Basin"*
Claudia Pahl-Wostl (Switzerland): *"The vision of a low energy society as guide for a polycentric climate change policy"*
James Risbey and Jerry Ravetz (USA/UK): *"Quality Assessment in Modelling Human-Environment Interactions"*

Key points of the discussion:

1. Endres and Ohl presented a rational choice assessment of the optimal use of different types of policy instruments. The discussion centered on two particular issues: how and why do countries arrive at different perceptions of environmental risk? What are the potential empirical applications of the theory? The presenter responded by saying that the model was still largely theoretical and needed greater empirical testing. The origin of state perceptions of risk was, she argued, not an explicit issue which she wanted to consider, but one warranting further research.

2. Yarnal et al outlined an empirical assessment of the views of US water resource managers about their vulnerability to climate change impacts. The audience was concerned about four particular aspects of the paper: was the presenter advocating a greater use of groundwater in preference to surface water? (no, he was not); did the principle of sustainability not counsel demand management instead of simply adapting the technology of water supply to cope with climate change? (yes it did); was the vulnerability of particular sectors defined by the analysis or by the respondents to the survey? (a combination of both; the two could and did learn from one another); why were younger managers less willing to innovate in response to climate threats (this finding was, admittedly, highly counterintuitive and had a number of possible explanations).

3. Pahl-Wostl presented an approach to integrated assessment which was informed by focus groups of lay people. The presenter argued that tourists visiting Switzerland did not participate in the groups.

4. Finally, Risbey and Ravetz outlined a checklist for improving the quality and the robustness of environmental models. The audience was concerned to see issues of fairness and justice fully reflected (which the presenter said they were). A modeller argued that in his experience lay people were more concerned about who had funded the research underpinning the models than the explicitness or otherwise of their guiding assumptions. This, he explained, reflected a deeper sense of public mistrust of science and policy making more generally, than a suspicion of the motives of and methods used by those trying to model processes of environmental change.

2.3 Institutionalizing Science in Global Environmental Policy

Chair: Stacy VanDeveer (USA)
Rapporteur: Angela Colthorpe (Japan)
Authors and Titles of Presentations:
Frank Biermann (Germany/USA): *"Institutionalizing science in global environmental policy between north and south - does access matter?"*
Aarti Gupta (India/USA): *"'Prior informed consent' in managing transboundary environmental risks - An institutionalized global procedure versus decentralized information generation"*
Wolfgang Jung (Germany/USA): *"The science-policy interface in international environmental regimes - Lessons from comparative analysis"*

Key points of the discussion:

- Big Science - Small impacts in the South
- Defining Biosafety under the convention on biological diversity
- Expert advice in global environmental decision making - How close should science and policy get?

1. The provision of GCM's (General circulation models) to people in India was found to be a problem due to the nature of the availability of funding. It was pointed out that APC provides funding for things of that nature.

2. The linking of policy making and science is perhaps a little too far stretched in saying that that was the reason why the Cartagena negotiations (biosafety protocol) failed. The chemical convention which took place last year was adopted without mention of the WTO. The main reason for the failure of the acceptance of the protocol was due to political and economic reasons as opposed to the link between policy making and science.

3. The problem with policy making is that the social sciences are being taken on board along with the natural sciences.

4. The IPCC process moves to include socioeconomic issues. There is much emphasis on capacity building in developing countries. The number of experts from developing countries have also increased on the panel.

5. There is a difference between the problem of the Ozone and of climate change. Whereas the ozone is a relatively simple problem in that the problem area is defined, climate is a complex issue. Developing countries lack the tools to analyze, and the data to solve issues.

6. The education of all women could be considered as a policy for tackling the problem of climate change. This not only enforces female status but brings down the fertility rate which would lead to a decrease in emittors. However the acceptance by the IPCC is unlikely due to the fact that climate change is not caused directly by women.

2.4 EL Niño

Chair: Roberto Sanchez (USA)
Rapporteur: David Barton Bray (USA)
Authors and Titles of Presentations:
Maria Carmen de Mello Lemos (USA): *"The use of climate forecast in policymaking: Lessons from NE Brazil"*
M. Pilar Cornejo-Grunauer (Ecuador): *"The human dimension of climate change: The trade convergence climate complex (TC3)"*

Key points of the discussion:

1. In the late 1980s and early 1990s when seasonal climate forecasts emerged as a viable tool for policymaking, FUNCEME, the regional Brazilian meteorological agency, oversold what it could do in terms of providing rainfall predictions that could be used by individual farmers (end users). A new seed distribution program was set up based on the release of climate forecasts, but farmers resented having the decision of when to plant taken out of their hands.

2. FUNCEME was not trusted by local people in Ceara because it was perceived as being "experts from the South" who did not know local conditions. People have more confidence in traditional "rain prophets" and are more forgiving of them when they are wrong, which is frequently, because they are part of their world.

3. Drought is a highly politicized issue in Brazil. There is a perceived "industry of drought" that drains resources from southern Brazil to the Northeast. If you publicly say, as FUNCEME did,

that you have the answer to drought prediction, you will get burned. As a result, FUNCEME ended up decoupling prediction from seed distribution. Other constraints to seasonal forecast use are data uncertainty, timing of release, perceived unreliability and inability of farmers to respond to the forecast.

4. In the case of Ecuador, university researchers were able to go directly to end users. There is no government agency in charge of climate information in Ecuador. If there was, perhaps people would pay attention to them.

5. There was broad access to the climate information offered by the researchers since their efforts were supported by the industry. The researchers gave workshops everywhere, to large producers and small. Not all responded to the information, some because they didi not have the financial resources to respond. In one case, because a community did not believe the information, although it was later one of the ones most impacted by El Niño effects.

6. Still a lot of uncertainty in the forecasts, particularly in 97/98. One finding that has emerged elsewhere in the project is that, in Panama, every January before a major El Niño there has been a larger rainfall in Panama.

7. Trust in the predictions comes from working with an economic sector for a long time, then they see the importance of using climate as a tool in management decisions.

8. Some sectors are easier to work with than others. Arable agriculture is always going to be much more difficult.

9. Sustainable development is an aspect of these research projects as well. The shrimp industry in Ecuador has become much more environmentally sensitive. They do not cut mangroves now and they reforest. They have also criticized the banana industry for use of agrochemicals that are effecting shrimp production.

10. In Brazil, rainfed agriculture is not environmentally sustainable, but they do not know what else to do. The new buzzword is water management, but they have tried that before.

11. Perhaps information is not the only answer, by itself it can not overcome inequalities. The information has to be presented as part of a more global package for addressing inequalities.

2.5 Land Use and Land Cover Change: Rapid Urbanization

Chair: C. M. Rogerson (USA)
Rapporteur: Gergely Toth (Japan)
Authors and Titles of Presentations:
Tunda Agbola (Nigeria): *"The Social and environmental dimensions of changing land-cover patterns in a hilly indigenous African city"*
Ram Babu Singh (India): *"Socio-economic dimensions of urban development, land use/cover change and responses to environmental change in metropolitan fringe of Delhi"*
Yo Shimizu and Yohei Sato (Japan): *"Analyzing the relationships between land uses, socio-economic and physiographic factors in Japan"*
Jin Chen and Hidefumi Imura (Japan): *"Study on the regional development, land use in China: Case study in Shenzhen city"*

Key points of the discussion:

*Questions (Q) / Answers(A)

1. On Singh's presentation:

Q1: What are the roles of ownership and what processes are taking place which relate the ownership structure and results in the decline of land resources in the study area ?

A1: Village communities used to own the land until recently, but in the last few years a substantial change can be detected in the land ownership: rich people buy up the lands which then become private property. In the 70's the government program to reform land distribution and solve the problem of landlessness had some result, but lately only the hilly regions continued to have the land ownership structure of that kind. This recent trend creates problems, which is predicted to grow in the future.

Q2: I would like to raise two issues a) how is urban waste affecting the sustainable land use systems, b) what is the effect of child labor ?

A2: Both are valid issues. Answer a), solid waste: landfill sites are presenting a big problem. Especially because most of the public drinking water supply relies on this resource, which is increasingly contaminated from the inappropriate landfills. We have included this effect into the model through groundwater quality assessment. Answer b), Child labor although I agree that it is a very important issue has not yet been modeled. We might included it in the future.

Q3:*How does urbanization (which according to your presentation also means industrialization)* affect the land quality? Does it have only concentrated (negative) effects in the urban areas or does it also have some indirect effect on the surrounding lands which are under other kinds of land use ?

A3: You know that trends show that from the Calcutta region where the industry used to concentrate there has been a shift to the New Delhi area in the last decades. Now, the polluting companies have to move out of the metropolitan areas which results in only transferring the problem further, but not resolving it. Thus the problem is remaining, and solutions have to be found in the future.

2. On Shimizu's presentation:

Q1: If institutional factors would be included in the model, they might reduce the effects of the introduced factors. Have you considered such additional development for your model?

A1: For the moment being our work concentrates on elements that can be expressed through a static model which I have introduced. We plan to extend the model to build elements into it, which allows dynamic simulations too. Then institutional factors can be considered too.

Q2: Slope classes seem to be decisive in the change of land use patterns. However, the scaling of the study makes it difficult to base conclusions on the slope class generalization. What was the data source you used here?

A2: The slope data is coming from Japanese statistical database, which classifies slopes into four categories. We have that data for each administrative unit.

Q3: So it was readily available for the analysis?

A3: Yes.

Q4: From the point view of land prices the period between 1975 and 1990 was the most important one. However the change in the land prices in the 90's was quite drastic. If you could apply land price data from 1996/97 the results may be different. Can you please comment on this?

A4: Our study could only apply data, which was published for 1990 (national agencies only released these data so far), therefore we could not include the recent period. But I agree with you, this

change might cause changes the direction of the change of the land use patterns.

Q5: Could you extend your canonical model for further submodels?

A5: Yes, it is possible to do, however at first we were interested in the two indicated ones.

3. On Chen's presentation:

Q1: What are the components of the white unclassified areas on your land use map ?

A1: Those area are barren lands which - for different reasons - could not be put into any classes. The sattelite image was not suitable for the decision, and ground observations could not classify those areas either. These areas were excluded from the analysis.

2.6 Land Use in Temperate East Asia

Chair: Teitaro Kitamura (Japan)
Rapporteur: Chuang Liu (China)
Authors and Titles of Presentations:
Dennis S. Ojima (USA): *"Integrated analysis of climate change impacts on land use in temperate East Asia (LUTEA): Integration of ecosystem and economic factors determining land use inder climate change"*
Lin Li (China),Yohei Sato and Kuninori Otsubo (Japan): *"A new concept for land-use change simulation model projections for China: Simulation of spatial expansion of a city by diffusion process"*
Togtohyn Chuluun, Dashdojiin Jamjyanaa and Dennis S. Ojima (USA): *"Land use change on the Mongolian Steppes"*

Key points of the discussion:

More than twenty scholars from Japan, China, Mongolia, USA, Netherlands, Indian, Sri Lanka, Canada, Germany, and Ethiopia attended the session and joined the discussion. Dr. Dennis S. Ojima (LUTEA Project Leader, Colorado State University, USA) presented an overview of the LUTEA activities and the LUTEA science plan. Mr. Lin Li (Graduate School of Agriculture, Life Science, The University of Tokyo, Japan), Dr. Togtohyn Chuluun (Scientist of Colorado State University, USA), and Dr. Guenther Fischer shared their most recent progress on land use/cover change in China and Mongolia studies at the meeting. The presentations attracted active discussion.

1. Dr. Dennis S. Ojima's presentation on Introduction to the LUTEA Project could help scholars worldwide to understand the critical regional issues in TEA and to promote the communication among the scholars who are interested in the studies about the TEA area. Dr. Ojima indicated that the issues of the food security, carbon storage, land degradation, and water resources were all critical in TEA. The LUTEA project should focus its effort on the topics of "intensification of agriculture", "factors affecting changes in natural and human aspects", "factors affecting changes in pastoral system", and "urban-rural interaction." Based on the integrated activities of the LUTEA project during the last several years, including the workshops, training programs and the Northeast Transect activities, LUTEA would pay more attention to the database development and data sharing this year.

2. Mr. Lin Li, presented his research on - A New Concept for Land Use Change Simulation: Model Projections for Cities, which is conducted by Dr. Lin Li and his colleagues including Mr. Yohei Satoh and Kuninori Otsubo from Japan. Mr. Li took Shuzhou City located in East China as an example to establish a city expansion simulating model, applied by diffusion theory or heat conduction theory, using TM remote sensing data in 1990 and 1995. Mr. Li summarized that city expansion may be regarded as flow of some substances, the driving forces could be population, city structure and income.

3. Dr. Chuluun analyzed the changes of the land use structure in Mongolia from 1950' s to 1990' s in his presentation on Land Use Change in the Mongolian Steppes (Dr. Dennis S. Ojima as the co-author). He emphasized that the population, livestock, policy and market could be the most important driving forces causing the land use change in Mongolia. Around urban area and close to the water area could be the most sensitive area in land use and ecosystem changes.

4. Dr. Fischer provided a demonstration with the CD-ROM - Can China Feed Itself? - A System for Evaluation of Policy Option. Supported by the historical agriculture statistics data and the related spatial datasets of China and the IIASA model projected to the agriculture of China, the conclusions were made. The conclusion that China can feed itself in 2025 at the projected population of about 1.5 billion which is in contrast to that of Dr. Brown (Who Will Feed China? 1996).

5. Active discussions, challenging questions and constructive suggestions were posed during and after the presentations. Dr. Yongyuan Yin (Atmospheric Environment Service, Environment Canada) suggested that the LUTEA project should pay more attention to the integrated studies between the climate change and the land use change. Mr.Bernard Okumu (Ethiopia) questioned the IIASA model, he suggested that it would be useful to the land use/cover change modeling if the watershed conservation could be considered in the model. Dr. Dennis S. Ojima suggested that the environment pollution including air pollution and water pollution may be considered in modeling China. Professor Zhao Shidong (Secretary General of Chinese Ecosystem Research Network, Chinese Academy of Sciences, China) shared more information about the China's agriculture in the meeting. He said that besides land, water resources, especially the fresh water resources, could be the most critical factor limiting the agriculture of China. Dr. Liu Chuang (Director of the Center for Earth Science Data and Information Network, CISNAR, Chinese Academy of Sciences, China) agreed with IIASA's conclusion. She said that the China data and the Chinese history show us that China can feed itself although China has to try hard in technology input. She pointed out that several projects (such as "agriculture in inch" project) were running in China, which could help the country to solve critical problems in China's agriculture. Both Professor Teitaro Kitamura and Dr. Liu Chuang commented that the LUTEA project is a good example, which made the human network as well as the academic cooperation across the boundaries among the countries, languages, cultures, and backgrounds. Keeping the LUTEA project going could benefit the global change studies.

2.7 Integrated Assessment for Environmental Security in the Asian Region

Chair: Yuzuru Matsuoka (Japan)
Rapporteur: Kejun Jiang (China)
Authors and Titles of Presentations:
Hideo Harasawa (Japan): *"Development of an integrated assessment framework for environmental security in the Asian region"*
Kiyoshi Takahashi, Hideo Harasawa and Yuzuru Matsuoka (Japan): *"Impacts of environmental change on food security in the Asian region"*
Lu Xianfu (China): *"Risk analysis of water resource scarcity in China"*
Toshihiko Masui, Yuzuru Matsuoka and Tsuneyuki Morita (Japan): *"Land use changes and their GHG emissions derived from biomass energy supply and food consumption pattern"*

Key points of the discussion:

*Questions (Q) / Answers(A)

1. On Harasawa's presentation:

Q1: How do you get policy factors into models?

A1: Several networks such as APN, Global Environmental Network, are opportunities to communicate with policy-makers.

Q2: What is the definition of environmental security?

A2: There are various kinds of security. i.e. human security, . . . environmental security is relationship between environment and human activity. To securitize would mean to improve such relationship.

Q3: AIM is getting more complicated, but at the same time AIM seems to want to communicated with policy-makers. It is very difficult to communicate with complicated model.

A3: First, start with complicated, and later develop more simple models on food, water, etc.

2. On Takahashi's presentation:

Q1: The model starts from climate change, but there is uncertainty in regional impact. Is your result robust enough? Other than climate change, there will be other social factors for food security.

A1: Currently, impact modellers have to depend on coarse results for simulation. But in two or three years, there will be better results from climate modellers. Not robust enough at this moment. It is true that there will be lots of social factors. The model results are preliminary. In the future, hope to consider such factors. In China, included education, etc. Some types of social factors. Should deal with long-term and short-term .

3. On Lu's presentation:

Q1: Infrastructure capacity, technological factors, how do you consider them in this model?

A1: The model talks about total water availability, not water supply. So do not consider social factors.

4. On Masui's presentation

Q1: Relation between crop (grain) production and meat production?

A1: Comes from GTAP.

Q2: If the study considered regions, would the results be different? (This model result is global, but actually demand and supply is regional.)

A2: Now the model considers regions.

Q3: Increase in meat production. Do you consider attitude change? For example in Europe there are more vegetarians in the last 10 years.

A3: This model deals with developing countries.

Questions for all speakers:

Q: What were the assumptions related to food production and trade for livestock production to meet increased demand for meat?

2.8 Demographic Processes and the Environment

Chair: Myron P. Gutmann (USA)
Rapporteur: Dudley L. Poston (USA)
Authors and Titles of Presentations:
Mame Demba Thiam (Senegal): *"Senegalese ghost cities in the context of sea-level rise in West Africa"*
Eugene Krassinets and Elena Tiuriukanova (Russia): *"Russia between east and west: New migration space"*

Key points of the discussion:

1. On the first paper:

* Analysis of abandoned cities or cities affected by displacement covers 100 or so years.
* Series of slides of such cities in Senegal raises the question whether it is possible to construct a well as protection from erosion. The answer is not a favorable one.
* Author raises the need of information dissemination activities to promote longer-term prevention strategies to help the 40 percent or so of the population that stands the risk of being displaced.

Discussion centered on 1): where the people go when they leave these places, 2): the reasons why climate and the elements cause the erosion.

2. On the second paper:

* Paper deals with international migration and geopolitical changes, and asks specifically how Russia contributes to this issue.
* Authors deal with the social and political issues behind illegal migration from the sending countries/regions of Northern China, Vietnam and North Korea.
* Illegal areas focused on include marriages, recruitments, prostitutes, human smugglers, criminal networks, etc.
* Paper also focuses on reasons for emigrating from Russia:, temporary migration seems to be most prominent reason.

Discussion centered on 1): the kinds of work the illegal migrants to Russia are engaged in, 2): possibility of development of regionalization of the Russian economy, 3): quality of the data.

Session 3

3.1 Industrial Transformation: Trade, Transport and Transitions

Chair: Sukehiro Gotoh (Japan)
Rapporteur: Eric W. Welch (Japan)
Authors and Titles of Presentations:
Kami Seo and Saburo Ikeda (Japan): *"Regional concept of material flow analysis toward sustainable world - Japanese experience of a negative sum game"*
Karl Steininger and Franz Prettenthaler (Austria): *"Reducing environmental impact by service use lifestyle: The potential of transition in individual transport"*
Ramakrishnan Ramanathan (India): *"Alternative paths of transport development: Efficiency, sustainability, and socio-economic analysis in the Indian context"*
Ben C. Arimah (Lesotho): *"Energy transition and its implications for environmentally sustainable development in Africa"*

Key points of the discussion:

1. Four papers were presented regarding significantly diverse topics. The first paper "Regional concept of material flow analysis toward sustainable world: Japanese experience of a negative sum game (Kami Seo and Sburo Ikeda), was given in three parts: forest resources in Japan, forest resources in South Asia and the interaction between them. Dr. Seo identified an important interaction between importer sink and exporter material reduction based on trade. There were two main audience responses. First, that there needs to be an explicit distinction in the definition of renewable forest resources used in the analysis between old growth forest and new growth forest. This distinction has both trade and material implications. Second, a contradiction was noted between Japan's efforts to improve their environmental image and the continued forest import problem. Dr. Seo noted that there are certain structural issues with regard to the specific Japan - South East Asia forest product trade analysis. These issues surround international price levels and land fill shortages due to Japan's size. Limitations to forest product trading may also need to include consideration of renewable scale. She noted that environmental labeling might be useful in this regard.

2. The second paper, presented by Karl Steininger, was entitled "Reducing environmental impact by service use lifestyle: The potential of transition in individual transport." The paper concerned car sharing cooperatives in Austria and presented results concerning the current status, potential market, and motivations for car sharing. Questions covered a range of issues. First, the speaker was asked whether his analysis provided any clues about other consumer products that might have similar characteristics to automobiles. Two fundamental criteria were identified for transferability of the cooperative concept to other products. First, the good must be of sufficient value (bicycle sharing does not seem to work). Second, it cannot have a bequest value (i.e. the product must have a limited life). Additional questions highlighted the need for population density, the significant reduction in miles driven by car sharers, competition and distinction with rental agencies, and the poor history of car sharing in developing countries.

3. The third presentation was entitled " Alternative paths of transport development: Efficiency, sustainability, and socio-economic analysis in the Indian context." The author, Dr. Ramakrishnan Ramanathan, first presented a description of the transport system in India, then used DEA analysis to compare energy efficiency or rail and road transport in India, and finally used results to

provide guidance to decision making. Audience responses noted that DEA is a non-stochastic analysis method and that the way it was being used for policy direction may require some caution. Second, one audience member indicated that the distinction between inter-city and intra-city transport needed to be taken into account. The author recognized this but noted that significant data limitations exist in India and that future work will attempt to take this into consideration.

4. The final presentation, "Energy transition and its implications for environmentally sustainable development in Africa," described energy transitions in Africa. The article was written and presented by Ben C. Arimah. The first part of the presentation separated African nations based on commercial energy transition. Based on this typology and other background knowledge a model was developed and tested that sought to identify the driving forces and barriers to energy transition in African countries. Questions following the presentation questioned why oil exporters were identified as some of the countries in which energy transition is not happening, and what the prospects were for alternative energy sources (wind and solar) in Africa. The author responded that in many cases the oil exporting countries do not have a developed domestic oil sector and therefore commercial energy does not penetrate domestically. Additionally, alternative energy sources exist in Africa, however they are rare for a variety of mainly economic reasons. Finally, future research should look to utilize more country specific variables.

3.2 Institutional Interplay: The Vertical Dimension

Chair: William C. Clark (USA)
Rapporteur: Leslie King (Canada)
Authors and Titles of Presentations:
Oran R. Young (USA): *"The problem of institutional interplay"*
Alf Håkon Hoel (Norway): *"Institutional interplay among environmental institutions in the Arctic"*
Suparb Pas-ong and Louis Lebel (Thailand): *"Implications of political transformation in Southeast Asia for environmental governance"*
Sharad P. Adhikary (Nepal): *"Social cultural dimensions and present decision making process: Scenario in a developing country - Nepal"*

Key points of the discussion

The discussion in this session was somewhat unusual because the organizers of the session wished to run it as a workshop on IHDP's Institutional Dimensions of Global Environmental Change projects. To this end, Oran Young, Chair of the project's Scientific Steering Committee, requested feedback and input from the audience that would be useful in providing guidance for the implementation phase of the project. Questions and comments therefore focused on potential future directions for the project and recommendations of areas of research that might prove fruitful. Institutional interplay is one of the major analytical themes of the project and since the session focused on vertical interplay, most of the comments and suggestions related to this concept.

*Questions (Q) / Answers(A)

1. Q:Does a (simple) linear model of institutional interplay work in the arena of environmental governance? The system is more complicated and processes interact at various levels.

   A:Agree the systems are very complex, messy and dynamic but need analytical methods of focusing.

2. Q:Is it not difficult to distinguish among vertical and horizontal interplay? Vertical and Horizontal interplay interact with each other and create cascading environmental impacts for example, in the developing word and its relationship with developed world in the interaction among the Climate change and biodiversity conventions. As a solution to climate change, plantations are planted to sequester Carbon which in turn reduces biodiversity.

   A:Agree, for analytical purposes we make a distinction among vertical and horizontal linkage, but they themselves interact. An interesting question might be the relationships between institutional interplay and the impact of other forces such as vested interests of elites.

3. Q:How and where should roles and tasks be assigned within and between different levels of social organization? What does the concept of subsidiarity mean for global environmental problems and governance? (either in identifying the most effective level for institutional development, or the level closest to the citizen (or problem)). EU example as an illustration.

   A:An important concept for the project - the politics, law and economics of assigning roles to different levels.

4. Q:The speaker questioned the myth of traditional institutions as necessarily or always being sustainable and therefore always worthy of being maintained.

   A:Agree that there is wide variance among traditional institutions and the important question may be what are the factors that lead to sustainability. Are there common factors that can be identified and to what extent is the impact of higher level institutions, one of those factors?

5. Q:When discussing vertical interplay, an important dimension might be current attempts to harmonize existing national/domestic approaches in an effective international regime.

   A:Yes, this is an important issue - demonstrated in economic institutions such as WTO.

6. Q:What is the role of the private sector in the interplay game? For example. The 40 top multi-national corporations have a very great influence on global environmental issues and governance.

   A:Yes, tremendous environmental implications of multinationals - often providing the pressures for harmonizing domestic arrangements - e.g. NAFTA.

7. Q:Do we need a typology of characteristics of interplay- e.g. Types of actors involved, public/private, types of interactions, etc.?

   A:Indeed interplay is a multidimensional concept. We should not be creating typologies for their own sake but rather as a response to a question or if it fills the need for an explanation of a phenomenon. We need to ask what are the puzzles and then perhaps a typology can help unravel the puzzle.

8. Q:What is the role of agents/individuals operating across levels of social organization as opposed to the interplay of institutions?

   A:Yes, the role of the individual change agent is an important empirical question, but agents work within institutions.

9. Q:In this very pluralistic domain, do we need a meta-fishing-analysis? Why should we fish some waters, some levels and not others; where should we set our hooks? Might institutions other than intentionally environmental institutions be equally or more important?

   A:Yes, placing the hook is the bottom line, interesting though the theoretical issue of interplay

may be, our concern must be with the substantive environmental issues. We need to place the hook in terms of these ultimate environmental concerns. Is interplay important in terms of explanation?

10: C:The IDGEC Science Plan is a very rich, 25-year program - need to prioritize.

A:Yes, that is the task facing the Scientific Steering Committee beginning with our initial meeting next week.

3.3 Eco-policy linkage

Chair: Hideo Harasawa (Japan)
Rapporteur: Kiyoshi Takahashi (Japan)
Authors and Titles of Presentations:
Tsuneyuki Morita, Mikiko Kainuma and Yuzuru Matsuoka (Japan): *"A historical analysis of Japan's desulfurization experiences for the 'Eco-policy linkage' design"*
Kejun Jiang, Tsuneyuki Morita, Yuzuru Matsuoka and Mikiko Kainuma (China/Japan): *"Integrated environment policy assessment for China"*
Yuzuru Matsuoka, Mikiko Kainuma and Tsuneyuki Morita (Japan): *"Energy policy and reduction of air pollutant in Asia and Pacific region"*
Mikiko Kainuma, Yuzuru Matsuoka and Tsuneyuki Morita (Japan): *"Comparison of strategies to reduce greenhouse gas emissions"*

Key points of the discussion:

1. On Morita's presentation:

* The speaker introduced the concept of eco-policy linkage in general at first. Then he explained how Japan decreased sulfur emissions in 1970s through analysis using the simulation model he developed.
* After the presentation, a more detailed explanation of the figure of the sulfur damage function was requested by one audience member. It was explained that the Japanese government compensated the people that suffered from air pollution using the fund collected from the polluters, and the amount of the compensation was decided according to the medical costs in hospital and the missing salary (opportunity cost) because of the illness. The figure illustrated the relationship between GDP/capita and the amount of compensation, and the derived relationship curve was used in their simulation to estimate the compensation cost.

2. On Jiang's presentation:

* The speaker showed the result of simulation analysis to estimate how much SO_2 emission is reduced in China, if the policy to reduce CO_2 reduction is applied. That is, how global policy affects the local environmental problems.
* One audience member suggested that the speaker should compare the cost of SO_2 emission reduction by employing only local policy and the cost of the reduction through the idea of eco-policy linkages, in order to find out which is the better choice. The speaker answered that the study was still at the preliminary stage, and started from estimating the reduced SO_2 with the CO_2 reduction policy. Another audience member supported the speaker, by explaining the basic idea of eco-policy linkage that to solve two problems in integrated way does not cost more than to solve the two problems one by one.
* One audience asked whether the impact cost of changed climate derived from SO_2 reduction was considered in the study or not, since SO_2 reduction will causes the local temperature increase. The speaker answered that he has not investigated it yet.

3. On Matsuoka's presentation:

* The speaker showed the result of simulation analysis of future SPM emission and its impact on human health (local environmental problem) under some energy policy scenarios.
* One audience member required more detailed explanation on the function which relates the infant mortality because of SPM with the SPM concentration. The speaker answered that the function was proposed in a USA study, and that the validity of the function is still controversial. However, he also thought the function was enough to estimate the health damage in order to set the rough policy.

4. On Kainuma's presentation:

* The speaker introduced the results of model simulation to estimate the economic impact in each region of the world of achieving the GHG emission reduction target agreed at COP3.
* One audience member confirmed the result that economic damage on OPEC countries is much higher than Annex I countries economic damage. The speaker explained that the figure expressed not the absolute value of GDP loss but the percentage change of GDP, and rationalized the result. The absolute value of GDP loss in OPEC is smaller than that in Annex I countries. The audience again pointed out that the absolute value of GDP loss in OPEC seems still considerably severe and more than that in Japan.

3.4 Vulnerability and Impact Assessment

Chair: Roberto Sánchez (USA)
Rapporteur: John Campbell (New Zealand)
Authors and Titles of Presentations:
Alejandro Leon (USA): *"Household vulnerability to climate change/Variability in the semi-arid Northern Chile"*
Gary Yohe (USA): *"Assessing vulnerability across 'not-implausible' futures"*
David G. Abler, James S. Shortle, Gbadebo Oladosu, Rajnish Kamat and Adam Rose (USA): *"Economic impacts of climate change in the U.S. Susquehanna river basin"*
Roberto Sánchez (USA): *"Learning from disaster: The vulnerability of Latin American cities to climate change and climate variability"*

Key points of the discussion:

1. There appear to be major problems in economic analyses of vulnerability in relation to non-market goods and subsistence economies.

2. Subsistence economic activities are nevertheless subject to influences from global markets.

3. There are scale related tensions in the analysis of climate change effects and vulnerability with quite different outcomes possible between the findings of macroeconomic analysis for example and small scale ethnographic approaches.

4. There was concern expressed over the widespread range of meanings attached to vulnerability. There was a danger that the term could become like sustainability and mean all things to all people.

5. There was concern expressed that an overemphasis on vulnerability excluded the very important strengths, resiliences and coping strategies of communities.

3.5 Land Use and Land Cover Change: Innovations in Modelling

Chair: Peter H. Verburg (the Netherlands)
Rapporteur: Helmut Haberl (Austria)
Authors and Titles of Presentations:
Kazuyuki Konagaya and Kuninori Otsubo (Japan): *"Generalized Thünen model for Asian land use change and LU/GEC project"*
Satya Priya and Ryosuke Shibasaki (Japan): *"Agricultural adaptation to climate change: Perspective from the Spatial-EPIC model"*
Krishnan S. Rajan and Ryosuke Shibasaki (Japan): *"Agent-based land use change model - A new concept in understanding human-land interactions"*
Bernard Okumu, Mohammad Jabbar, David Colman and Noel Russel (Ethiopia/UK): *"Watershed conservation in the Ethiopian Highlands: Application of a bioeconomic model"*

Key points of the discussion:

1. In this session there was no "general" discussion of all four presentations. As usual, after each presentation the respective speaker answered some questions or comments of participants. The following three questions referred to general problems of land use modeling:
   1) How to aggregate the behavior of individual farmers or processes on individual farms on a larger regional level?
   2) How to tackle the problem of different spatial scales at which different kinds of data are available? For example, socio-economic data usually refer to administrative units (e.g., counties, districts, etc.) whereas biophysical data derived from remote sensing are available for - usually much smaller - grid cells.
   3) How to model the effects of changes in policy? This was generally agreed to be one of the most difficult issues in modeling, even in the actor-based model presented.
2. General answers to these questions with which most if not all attempts to model land use and cover change are struggling, of course, have not been found. There seems to have been progress in tackling these problems, however, the solution will always depend on the problem to be solved and the modeling strategy employed.
3. The other questions mostly were of a technical nature; i.e., it was asked exactly how some parameters, factors or framework conditions had been taken into account in the respective modeling exercise.

3.6 Carbon Management Post-Kyoto

Chair: Shuzo Nishioka (Japan)
Rapporteurs: Aki Maruyama and Kiyoto Tanabe (Japan)
Authors and Titles of Presentations:
Suzi Kerr, Alex Pfaff, Arturo Sanchez, David Schimel, Joseph Tosi and Vicente Watson (USA/Canada/Costa Rica): *"Can the CDM work for tropical carbon sinks? Integrating economics and ecology to evaluate policy options"*
Zili Yang (USA): *"The Kyoto protocol and the prospect of Sino-Japanese coal trading"*
Yoshiki Yamagata (Japan): *"Institutional dimension of sink issue for cooperation under the Kyoto Protocol"*
Michael Dutschke, Axel Michaelowa and Marcus Stronzik (Germany/France): *"Tightening the system: Central allocation of emission rights"*

Key points of the discussion:

The Chair noted difficulties involved in achieving the Kyoto target through international cooperation. Reasons may include complexity of the Kyoto mechanisms, inclusion of carbon sequestration, which entails uncertainties, and the possibility of weakening the attainment of objectives of the Kyoto protocol, and required economic restructuring.

1. On Pfaff's presentation:

* Taking the case of Costa Rica, Pfaff showed an example where economics provides a usable land-use baseline function and ecology provides a usable rule for carbon-credit awards. Using econometric analysis and ecological analysis of observed/estimated carbon sequestration, the work tries to calculate the carbon sequestration supply curve.
* A comment was made that it was a ground-breaking work in the sense that it is an econometric model applied for baseline in the forest context. Questions were raised regarding the discount rate used in the model and possible leakage at district level. For the discount rate, the presenter argued that the very reason for taking an econometric approach is that it enables you to avoid taking an engineering approach where you claim to know economic behavior of landowners even when it is impossible to do so. Therefore, it does not need to compute any discount rate in the model. As for the leakage, the presenter noted that it is an issue to be addressed especially for a non-national baseline.
* Regarding the approach for integrated analysis of ecological and economics, a kind of defect was pointed out; it did not consider demand side behavior although supply side behavior was taken into account. However, the presenter thinks that the approach can indicate the price so that the private sector investors can compare it with the domestic marginal abatement cost.

2. On Yang's presentation:

* Further consideration might be necessary for better projections of Sino-Japanese coal trading, particularly by taking into account the quality of Chinese coal, such as sulfur content, in view of the Japanese need to prevent acidification. It seems not so significant, however, when analyzing the difference between the BaU case and the case of the Kyoto Protocol implementation.

3. On Yamagata's presentation:

* Regarding the estimation of carbon emission and sequestration from ARD activities, the possibility of overestimation caused by lack of accurate data was pointed out. The estimation was rather reasonable in Yamagata's view, however, because it had been calculated by using ecology-based data prepared by ecologist, not FAO or forestry inventory type of data, and the scenario taken up by IMAGE II.
* A comment on Science-Policy interaction was given, noting the initiative made by SBSTA requesting IPCC to estimate the scientific implication of the sink issue was an important one.

4. On Michaelowa's presentation:

* A question was raised regarding the monitoring responsibility which seems to be borne by national governments in the suggested central bank model. In reply, the presenter said that the suggested model relies on the Kyoto Protocol monitoring system.
* As for the institutional scope of the suggested central bank-i.e. whether it related to any of the UN agencies, the World bank or GEF, or private sector entitles such as US company led organizations etc.- the presenter thinks that the proposed central bank should beestablished under the auspices of FCCC for the sake of credibility and no-gaming possibility.

3.7 Attitudes and Behavior: European Perspectives

Chair: Riley E. Dunlap (USA)
Rapporteur: Paul Stern (USA)
Authors and Titles of Presentations:
Kersty Hobson (UK): *"Sustainable lifstyles and behaviour change"*
Michael Scheuermann (Germany): *"In search of innovation co-ordinated research on global environmental change as a starting point for sustainable behaviour"*
Kristine Vlagsma Brangule (the Netherlands/Latvia): *"Consumer's values and the sustainable use of environment"*

Key points of the discussion:

1. What would a discursive space be, in which discussion would lead to behavior change? Difficulty of transferring models across countries.
2. What are "discursive/gatekeepers" that may prevent behavior change?
3. How to bridge gap between behavior changes and infrastructural changes?
   Can discursive spaces get people to think about the infrastructure? (perhaps by acting collectively?)
4. Some lifestyle changes can matter a lot (e.g. refusing genetically modified foods).
5. Does the German research on changing behavior offer answers to the above questions?
6. Measurement error issues in measurement of values.
7. How many segments are there on the basis of values?
8. How much value change is there?
9. How value models changes across countries?

3.8 Sustainable Urbanization in East and Southeast Asia

Chair: Yasuko Hayase (Japan)
Rapporteur: Ronald Rindfuss (USA)
Authors and Titles of Presentations:
Runlong Huang (China): *"The floating population in megacity, China-Facts and Problems"*
Hiroshi Kojima, Yasuko Hayase, Satoshi Nakagawa, Haruo Sagaza, Masato Shimizu, Shinichi Takahashi, Nimfa Ogena and Bhassorn Limanonda (Japan/the Philippines/Thailand): *"Sustainable urbanization and religion in Southeaset Asia"*
Dudley L. Poston and Marcella E. Musgrave (USA): *"The effect of climate on internal migration in China and the United States"*

Key points of the discussion:

1. The floating population in China, that is, migrants who have not received official permission to migrate, exists because of the poverty in many rural areas of China. There was discussion about

possible solutions to rural poverty.

2. The issue of migration streams arose in the discussion of all three papers. The availability of relatives in destination sites is an important determinant of the selection of destination for the floating population in China. Migration status was a key stratifying variable in the selection of focus group members in Thailand and the Philippines. Prior migration streams might affect the density and other variables in the U.S. multivariate model.

3. The relationship between the teachings of various religions and the environment was discussed. It was noted that Buddhism in Thailand explicitly teaches about the environment, and that within the Christian religions there were conflicting philosophical approaches to the environment in the Old Testament.

4. The use and meaning of various climate indexes were discussed, including the effect of changing from Centigrade to Fahrenheit.

Overall, the discussion was lively, constructive, and interesting.

Session 4

4.1 Industrial Transformation

Chair: Peter H. Verburg (the Netherlands)
Rapporteur: Nadia Herb (the Netherlands)
Authors and Titles of Presentations:
Hidefumi Imura (Japan) and Richard Rockwell (USA): *"Cities and industrial transformation"*
Ken Green (UK) and Luis Fernando Vieira (Brazil): *"Food and the global environment: Mapping, modelling and making scenarios"*
Sukehiro Gotoh (Japan): *"Information and communication"*
David Angel (USA): *"Transformation processes"*

Key points of the discussion:

1. The session on the Industrial Transformation Project opened with a brief introduction by the Chair, Pier Vellinga (Chair, Industrial Transformation Scientific Planning Committee). He described the Industrial Transformation Programme as an international, multi-disciplinary research initiative aimed at understanding complex society-environment interactions, identifying (potential) driving forces for change, and exploring development trajectories that have a significantly smaller burden on the environment. Prof. Vellinga then defined the main goals of the programme and industrial transformation research characteristics. Finally, he described the bottom-up consultative process in which the research agenda has been developed to date and introduced the Second Draft Science Plan, which is open for comment until September 1, 1999. Before introducing the four speakers, the Chair encouraged wider participation in the Industrial Transformation Project.

2. After Hidefumi Imura and Richard Rockwell presented the Cities and Industrial Transformation research, the following comments and questions emerged in the discussion:

   * The Cities and Industrial Transformation research focuses on two human needs and two biogeochemical cycles, namely water (hydrological cycle) and transport (carbon cycle). A participant questioned the choice of studying the carbon cycle, suggesting a focus on nitrogen or sulfur.
   * Given the dramatic increase in the number and size of cities expected in the future, the importance of introducing incentives early in new cities was emphasized. The importance of incorporating consideration of the financial sector into such studies was highlighted.
   * Referring to the choice of cities for comparative studies, a participant underscored the importance of including sub-Saharan African cities. The inclusion of developing country participation and perspectives is a fundamental component of the Industrial Transformation Project, however a participant noted that there are such vast differences among cities in developing countries and questioned whether it would be possible to develop sustainable solutions applicable for numerous cities.
   * The importance of information and communication systems as a way to induce and support transformation was mentioned.

3. Ken Green introduced the Mapping, Modeling and Making Scenarios Project being developed under the Food focus.

   * During the mapping stage of the project, it is anticipated that a large amount of existing data

will be used as well as gathering new data. It was agreed that the quality of data should be closely considered as data may represent a political statement rather than an accurate reflection. Inconsistencies between wage economies and subsistence economies will also be taken into consideration.

* The modeling phase of the project will model global and regional FCPS with respect to the environmental impacts of changing technologies, industrial structures and final consumer demand. A participant suggested presenting case studies, such as the "white revolution" of milk production or the successful sugar production in India. In addition, the expansion of large food production multi-nationals into developing areas will be explored.
* In developing models for sustainable food consumption and production systems, it was agreed that such models could learn and make use of data from initiatives such as the 2020 initiative of IFPRI and others of the FAO.
* It was agreed that the overall research questions for the project should be more clearly defined.
* While discussing issues of food security, clear links with the Human Security project of IHDP project were emphasized.

4. Sukehiro Gotoh then introduced the Information and Communication focus of the Industrial Transformation Project:
   * Three international, multi-disciplinary research directions are proposed within the Information and Communication focus. A participant suggested that this focus theme should more clearly define what sustainability (or decoupling) the research is trying to achieve.
   * It was suggested that the third research direction, focusing on images of lifestyle, should incorporate consumption issues in OECD countries and, for example, the demonstration effect. It was also suggested to make this project part of the Transformation Processes focus.
   * A general remark was made about the importance of Information and Communication aspects for all of the foci. The need for a separate focus on this topic was questioned.
5. Finally, David Angel presented his views on the Transformation Processes focus.
   * After the final two presentations, some participants identified the overlap and similarity between the Information and Communication focus and the Transformation Processes focus. It was also recognized that the Transformation Processes focus is a cross-cutting theme. For example, one participant suggested that many of the research questions put forward under Transformation Processes would enrich and strengthen the other foci as well.
   * Regional political and social conditions need to be taken into account when discussing industrial transformations. Asian countries, for example, are going through revolutionary reform.
   * A participant questioned if criteria exist for determining whether the action research and intervention proposed will benefit the societies involved.

In conclusion, the Chair thanked all the participants and speakers for their input.

4.2 Environmental Conflict Management

Chair: Chris Cocklin (Australia)
Rapporteur: Alexander Lopez Ramirez (Costa Rica)
Authors and Titles of Presentations:
Alexander Lopez Ramirez (Costa Rica): *"Environmental change and social conflicts in the Brazilian Amazon"*
Euston Quah and Khye Chong Tan (Singapore): *"The NIMBY and NIABY syndrome in facility siting"*
Okechukwu Ibeanu (Nigeria): *"Bringing the local people back in: Community-based strategies of*

environmental conflict-management in the Niger Delta, Nigeria"
Steve Lonergan and Kent Gustavson (Canada): *"Developing an index of human insecurity"*

Key points of the discussion:

* Debate centered on the ability to distinguish between correlation and causation between environmental change and social conflicts. Some participants mentioned methodological shortcomings in establishing the higher standard of causation.
* Participants discussed multiple methods for quantifying social costs. Participants were concerned that the lowest social cost sites were in the poorest locations, raising ethical questions about siting. Some suggested that at least the poorest communities received compensation where they often do not under other schemes.
* Regarding NIMBY investigations, what is the value added of including the discussion within the conflict framework as the "conflicts" are worked out within classic negotiation procedures.
* Selection of indicators has by definition some component of arbitrariness. Is there a way to prioritize among the variables? It was agreed that some variables are more important than others are and the future research agenda requires setting these priorities.
* Value added of the indicators comes from tracking changes over time and breaking out the measures for regions.

4.3 Decision-making Processes

Chair: Eduardo Viola (Brazil)
Rapporteur: Marcel T. J. Kok (the Netherlands)
Authors and Titles of Presentations:
Anand Patwardhan and K. Vinayak Rao (India): *"The Indian science-policy interface: Insights from the process of Indian climate policy formulation"*
Anders Hjort at Ornaes and Sylvia Karlsson (Sweden): *"Managing complexity across scales from common resources to common policy/security"*

Key points of the discussion:

* Model-outcomes of the ICAM-3 model which suggests that the prices of tradable permits will be volatile. Fluctuating prices do not give clear signs for developing long-term strategies. It was discussed to what extent the fluctuations in the prices of tradable permits may have negative impacts on developing long term R&D strategies.
* The question of trust in developing environmental policies. A distinction was drawn on the bases of the discussion between trust as part of the deep value system (which might need to be transformed to take responsibility for the environment) and trust as in playing according to common interests and accountability and in joining processes.

Several issues were discussed:

- fundamental changes that are necessary in current regimes to build up trust (common will)
- the fact that trust is build up more easily in horizontal regimes then in vertical regimes
- ways to build up trust (involvement of other parties, interactions among persons, education) and the fact that this will take a long time

- the fact that building up trust is not facilitated by the fact that nations go after their own interests in international negotiations
- why we should trust anybody and why it is important to discuss this issue
- the role of scientists in building up trust
- trust in process and trust in parties; even if you do not trust other parties, engaging yourself in a process is a way to building up trust
- win-win options as a way to build up trust and the realism of thinking in terms of win-win options

* Differences at the science-policy interface in the way India dealt with the trade- and environment-regimes. It was shown that in the trade regime there was a far more sustained effort to draw on academics in developing policies. Furthermore the comparison showed the importance of communicating research results from science to decision-makers.

4.4 Urbanization

Chair: Jill Jäger (Austria)
Rapporteur: Jill Jäger (Austria)
Authors and Titles of Presentations:
Daniel Joseph Hogan, José Marcos Pinto da Cunha, Roberto Luiz do Carmo and Antonio Augusto Bitencourt de Oliveira (Brazil): *"Urbanization process and socio-environmental vulnerability: The case of Campinas, Brazil"*
Basireddy Sudhakara Reddy (India): *"The metabolism of a city: A case study from India"*
C. M. Rogerson (South Africa): *"Coping with urban vulnerability in Africa: The role of urban agriculture"*.

Key points of the discussion:

Much of the discussion focussed on the topic of urban agriculture, the subject of one of the papers in the session. Points included:

1. What can we learn from examples of urban agriculture in Africa, for sustainable development in countries of the industrialized north.

2. Work is still needed to produce a consistent definition of urban agriculture. (e.g. does it only include foodcrops or does it include livestock.) Where is urban agriculture carried out? Can peri-urban agriculture be included?

3. Expansion of urban agriculture challenges the way we think about cities.

4. Urban agriculture is one part of the jigsaw in helping the urban poor.

Other topics in the discussion:

1. Rates of urbanization (which have slowed down in the 1990s in Africa because of the macroeconomic environment.)

2. Sources of biomass for energy supply in Indian cities

3. Large scale urban growth in the 1980s which still occurs without adequate income layers and infrastructure.

4.5 New Data Acquisition and Integration Methods for LUCC Studies

Chair: Kuninori Otsubo (Japan)
Rapporteur: Togtohyn Chuluun (USA)
Authors and Titles of Presentations:
Yukio Himiyama and Qinxue Wang (Japan): *"The use of GIS for the study of land use/cover change"*
Qinxie Wang and Yukio Himiyama (Japan): *"GPS-GIS-RS Integration for the study of land use/cover change"*
Ryosuke Shibasaki (Japan): *"Challenges of remote sensing for land use/cover change studies"*
Ramasamy Krishnamoorthy and S. Ramachandran (India): *"Social factors in coastal land use and land cover change in India: Remote sensing and ground truth approaches"*

Key points of the discussion:

1. On the first presentation
There were no questions or comments.

2. On the second presentation
There were one question and one comment. The question was how data taken by Global Positioning System can be adopted for old maps. The answer was that some old maps had wrong information on the positions of villages, therefore, the GPS data could be used for the correction of the positions. The comments was that sometimes it was difficult to make analysis with GPS data, thus, it was better to use multi-scale RS information like TM and AVHRR maps, etc. The presenter agreed with the usefulness of multi-scale RS information; however, he also pointed out huge work when covering large areas by TM images.

3. On the third presentation
There were two comments and one question. The first one was about an indicator to determine distribution of population from night images of RS data. The ratio of population of one district to another one was suggested as the indicator. The presenter replied that there were several methods to estimate the population for the night images and the suggested indicator might work well. The second was about improvement of interpretation of RS data, and that the work on socializing pixel by social scientists would be very helpful when the dynamic data were given. The question was how to enhance the participation of social scientists in LUCC research activities basing on RS derived data. The presenter replied that one possible way was the creation of RS data dictionary and its wide dissemination.

4. On the fourth presentation
There were two questions. The first one was what kinds of RS information were used for differentiating mangrove trees. The presenter replied that he used a special channel near to the infrared one. The second was if there were many projects on bio-diversity issues for Indian coasts or not. The answer was that there were many.

4.6 Land Use and Land Cover Change: Subsistence Agroecosystems

Chair: David Barton Bray (USA)
Rapporteur: Roberto Sánchez (USA)
Authors and Titles of Presentations:
Ronald Nigh (Mexico): *"The contested mosaic: Social and ecological dimensions of land use change in the Lacandon rainforest of Chiapas, Mexico"*
Thomas Crawford, Barbara Entwisle, Julia Reade, Ronald Rindfuss, Yothin Sawangdee and Steve

Walsh (USA): *"Methodological Considerations in linking household behavior to land use change: Nang Rong, Thailand"*
Sudhakara Reddy, Jyoti K. Parikh and Vijay Laxmi Pandey (India): *"Social dimensions of land cover change: Survey and analysis of case studies from India"*
Rakesh Kumar Maikhuri, K. S. Rao and R. L. Semwal (India): *"Loss of agrobiodiversity and changing scenario in the cropping patterns of the Indian central Himalaya, India"*

Key points of the discussion:

1. This session presented four case studies of land use and land cover changes in different parts of the world with some similarities. Maikhuri's paper focused on the impact of social changes on patterns of traditional agriculture in the central Himalaya. The combined impact of poverty, degradation of local forests and public policies seeking a maximization of profits through monocropping of cash crops and the introduction of high yield variety seeds at subsidized prices, have produced a sharp decline of agrodiversity. Ronald Nigh's paper follows a similar approach. Nigh highlights the likely positive effect that Mayan presence has had on the positive effect on biodiversity and forest regeneration. As Maikhuri before, Ronald Nigh stresses the impact of public policies on forest conservation and regeneration. In the case of the Lacandona, Chiapas, the creation of the Montes Azules Biosphere Reserve in the late 1970s, intended to increase land cover protection, provoked many of the social conflicts currently affecting land use changes in that region. This case study, as the one in the Himalayas mentioned above, illustrate the dramatic consequences of well-intended, but fragmented and incomplete public policies.

2. The last two presentations provided complementary results with a different approach. The paper presented by Ronald Rindfuss provided useful experiences for other land use-land cover change studies. The paper presented an interesting assessment of failures and successes of methodologies that link households, land parcels, social science data and satellite data. Sudhakara Reddy's paper discussed the experience of land cover change programs through tree growers in six villages. The study highlights the importance of beneficiaries as a significant factor contributing towards effectiveness and sustainability in land cover change programs. The presentation also stressed the role of women, the distribution of benefits, and democratic decision making processes as important social factors in the success or failure of land cover change programs.

3. The presentations were followed by a dynamic interaction with the audience through questions and answers. There was a consensus about the value and importance of discussing case studies in different parts for a better understanding of land use and land cover change.

4.7 Attitudes and Behaviour: Climate Change

Chair: Marvin S. Soroos (USA)
Rapporteur: Riley E. Dunlap (USA)
Authors and Titles of Presentations:
Marieta P. Staneva, Robert E. O'Connor, Richard J. Bord, Ann Fisher, Veska Kozhouharova-Zhivkova and Stanka Dobreva (USA/Bulgaria): *"International comparison of public perception of global climate change: Bulgaria and the United States"*
Harriet Bulkeley (UK): *"Common Knowledge? Public understanding of climate change in Newcastle, Australia"*
Marja Järvelä (Finland): *"Climate change and lay observatons"*
Ahmed Salahuddin (Bangladesh): *"Climate change impacts and suggestions for mitigation: An assessment of coastal islands"*

Key points of the discussion:

1. On Staneva's presentation:
Questions were asked about the methods used in the study of the USA and Bulgaria. One questioner noted that a recent Swedish study-team has conducted a risk-perception study in Bulgaria that appears to have yielded similar results.

2. On Bulkeley's presentation:
A question was raised about the possibility that the public views reported might have been affected by debate over Kyoto, but the research was completed well in advance. Another comment expressed agreement that using experts to "educate" the public is not effective, and in response the presenter emphasized the importance of institutional factors. The findings suggest people are concerned, but unclear about what they personally can do to combat global warming. Another questioner emphasized the difficulty of communication of scientific information about global warming because of natural variability in climate, and expressed concern about generating unrealistic unexpectations by the public about scientific certainty.

3. On Järvelä's presentation:
A comment noted that the theme of the paper was that more technical information was not what the public needed. What is emerging is the notion that the public needs/wants information on what they personally can do in response to global warming, rather than more scientific information on the details of global warming.

It was noted that Finland seemed to be particularly consensual, especially relative to Australia and the USA. A final comment noted the role of interest groups in generating "dissensus" on climate change in the USA and Australia.

4. On Salahuddin's presentation:
A question was raised concerning the level of awareness in Bangladesh of that nation's vulnerability to the impacts of climate change. In response, the presenter noted that after the extreme weather events of the 1990s, there is more effort to inform the Bangladesh people about the likelihood of disasters, although there is often misinformation as well.

4.8 Innovative Social Sciences in the Coast Zone

Chair: Brent Yarnal (USA)
Rapporteur: Susanne C. Moser (USA)
Authors and Titles of Presentations:
Heather Voisey and Tim O'Riordan (UK): *"Decision-making in the coastal zone: Involving people through deliberative and inclusionary processes"*
Douglas H. McGlone and Liana Talaue-McManus (the Philippines): *"Linking watersheds and coastal estuaries: Material flows and economic approaches for Lingayen Gulf, the Philippines"*
Neil Adger, Katrina Brown, Emma Tompkins, Peter Bacon, David Shim and Kathy Young (UK/Trinidad and Tobago): *"Engaging with stakeholders and trading off their preferences: Marine protected areas in the Caribbean"*
Nicholas Flanders, Lawrence Hamilton and Cynthia M. Duncan (USA): *"Climatic versus institutional change in North Atlantic fishing communities"*

Key points of the discussion:

1. In coastal resource management situations with diverse sets of stakeholders, entrenched conflict among them regarding policies and management options, and growing resource pressures, a

deliberative and inclusionary process (DIPS) can improve the quality of the decision-making process in which participants gain greater ownership and are accountable to each other.

2. Where basic values and perspectives of stakeholders are closer to consensus already, such a deliberative, inclusionary process is also useful to built trust among participants, to increase buy-in and local support for management options.

3. It is unclear as of yet, however, whether actual management outcomes would be significantly different with or without such a process.

4. Continued observation and research has to show whether such deliberative, inclusionary processes get formally and/or permanently institutionalized, whether they are sustained over the long term, and for what types of management situations, they may be most appropriate and effective.

5. Stakeholder involvement in and of itself may be viewed as a favorable outcome of such a process, but it can only be sustained if participants see real outcomes, actual returns for the time, effort, resources they expended.

6. Integration of physical/ecological data and economic data is no longer the methodological cutting edge, but still very useful (and relatively quick) for scenario development and the valuation of environmental services; the limitations to this integration include data availability and the scientific understanding of causal linkages between natural and social systems (i.e., system complexity and compounding uncertainties).

7. Scenario development and discussion of evaluation criteria as part of visioning exercises among stakeholders seem useful tools for consensus building and policy development, but higher-order policy development introduce locally uncontrollable policy uncertainties that can effect the success of local management choices.

8. Discerning the relative importance of social institutions (rules of the game, patterns/norms of behavior) versus climatic variability in explaining changes in resource extraction/management practices, community viability, and societal responses to natural or social changes is very difficult; sensitivity of the resource to climate variability, institutional resilience, and the possibility to externalize negative impacts and importing additional resources or options seem to be important intervening variables.

Session 5

5.1 Study of the Environmental Management and Audit

Chair: Katsuya Fukuoka (Japan)
Rapporteur: Katsuya Fukuoka (Japan)
Authors and Titles of Presentations:
Katsuya Fukuoka (Japan): *"Study on business-administrative theory of environmental management/ Audit"*
Takeshi Mizuguchi (Japan): *"Meaning of environmental protection and environmental audit"*
Phillipe Paulin (EU, Brussels): *"Actual situation of HACCP as environmental manegement/Audit in Europe and America"*
Tetsuro Mori (Japan): *"Actual-state analysis of environmental audit certification"*

Key points of the discussion:

1. The International Standardization Organization (ISO) is primarily an institution whose objective is "facilitating international trading process through standardizing the quality of goods and institutional management."

2. Established in 1992, the British Standards Organization has enforced the BS (British Standards) 7750. While its standards system remains a quasi-restrictive framework anticipating the voluntary participation of businesses, its standards are applied to all goods and institutional standards and are regarded primarily as a guideline for hard goods (systems).

3. After a study of the environmental assessment standards of the European Communities, the European Standardization Organization made its own version of standards public in July 1993 with an enforcement target date set for April 1995. Its standards required work on individual environmental policies, targets, reports and action programs, along with the development of environmental management systems.

4. The standards required enterprises to conduct voluntary audits of their standardization systems at least once a year (3 years in principle), either by their own auditors or outside (independent and fair) auditors. The environmental audits are to be followed by the documentation of environmental statements and additional audits by authorized environmental certifiers. Failure to obtain acknowledgment from the certifier will result in the nullification of their authorization. The authorized businesses are allowed to use authorization labels as visible indicators of their qualification.

5. As a result, environmental labels became an important tool to appeal to consumers, and firms are now forced to make added efforts to carry out life cycle assessment (LCA).

6. One of its aims is the reduction of environmental burdens such as the use of natural resources and energy, as well as the discharge of waste materials into the atmosphere, bodies of waters, or soil during the course of exploitation, production, processing, marketing, consumption, utilization, recycling, and disposal of natural resources. Accordingly, the standards require a quantitative approach through a scientific analysis of data, and weighing it according to its quantitative contribution to restrictive standards and targets.

7. The moves of the ISO and European Communities have resulted in the formation of new rules

for international trading process. Export to the European market is now virtually impossible without meeting the European ISO's environmental management and audit standards (EMAS). For enterprises dealing with the European market, the door will be remain shut unless they have authorization to conduct ecological assessments both in and out of Europe.

8. In Japan, a voluntary program to ready enterprises for the new rules has been under way since 1994. With the guidance of the Ministry of International Trade and Industry, mostly major firms listed on the stock market participated in this program. There is still an imminent need to reinforce the system by adding smaller firms, and by spreading the environmental auditing system to neighboring Asian countries. Additionally, Japan is required to respond to ISO moves, modify JIS (Japan Industrial Standards), and adjust its details so as to be compatible with the PL (Product Liability) Law.

9. Sweeping enthusiasm over environmental assessment in the international community is expected to reach its peak towards the close of the 20th century. Economic activity is an artery-to-vein circulation of materials, and maintaining an input-output balance conforms to the ecological economic principle and is essential for a steady cycle of coexistence between man and nature. It is an undeniable fact that ecological problems are still relegated as a last choice and they cannot be solved without economic consideration. The current zeal for ecological management is not a cure-all. In fact it is feared that this enthusiasm will possibly cause slackening and erosion in alarm for the ecological crisis. The same may be true with consumers who are satisfied with the Eco Mark, the Japanese version of ecolabels.

10. Every policy choice must be based on the recognition that coexistence and ecological cycles continue to helplessly collapse despite the efforts of the market and industry. These choices must also be based on the recognition that the entire ecosystem is on the verge of being unrecoverable, far beyond preservation.

11. Consumers will have to be more conscious of their social responsibilities for ecological burdens they place on the environment. They will eventually refrain from wasteful consumption if the resultant garbage comes back to them as an added burden on their household economy.

12. Consumers will to start consider the cost of waste disposal along with the recycling potential (recycling systems of the manufacturer) of their purchases, and these factors will be reflected in their evaluation of goods.

13. Enterprises will be unable to devote themselves to the positive aspect of supply. Their activities will have to include such negative processes as disposal and recycling, and their very "survival" will depend on how they can cope with this negative demand.

14. Human activity is, in a sense, material circulation. Man obtains materials from nature and returns the same quantity back to nature in the forms of industrial waste, household garbage, or recycled industrial waste. This material cycle runs within the framework of the ecological system of nature that includes man and determines how "ecology" fares.

15. On the other hand, the "market system" (economy) is shaped by the circulation of money, and merchandise, which involves businesses and consumers, is only a part (subset) of "ecology." Environmental problems are nothing but the results of repugnance between "economy" and "ecology."

16. If human survival is impossible without repairing our damaged environment, the logical consequence will be to link economy with ecology, and every effort should be directed to this last resort. As one of the most challenging tasks in human history, this must be attained by

simultaneous shifts towards an ecology-oriented economic society, ecology-oriented businesses, and also towards ecology-oriented consumer lifestyles.

17. The ecological revamping of business seems to be unavoidable and environmental audits will be an integral part of the joint international effort for this revamping.

5.2 Conflict and the Environment: Conflict Resolution

Chair: Michael Brklacich (Canada)
Rapporteur: Richard A. Matthew (USA)
Authors and Titles of Presentations:
Mark Levy (USA): *"Does environmental harm cause political instability? Lessons from the CIA tasks force on state failure"*
Carlo Jäger and Ottmar Edenhofer (Switzerland/Germany): *"Water resources and social conflict"*
Yasuko Kawashima (Japan): *"Climate change and security: Regional conflict as a new dimension of impact of climate change"*
Joseph Alcamo (Germany): *"The GLASS model: Preliminary results from an integrated approach to global environmental security"*

Key points of the discussion:

The discussion across the four papers focused on two themes:

1. Issues about the availability and quality of data required to test models.

With respect to the Failed States Project, discussion indicated that in many cases the data were not available to test and fully implement the models. Similarly, concerns were raised about the impact of data deficiencies related to water uptake by vegetation and by humans on the predictions of the GLASS Model.

2. Issues related to environmental and security linkages.

Environment and security linkages are often indirect and hard to measure, but can exacerbate tensions and the potential for conflict. For example, it is more likely that climate change would exacerbate necessary conditions for conflict rather than be the primary cause or trigger. Similarly, virtual water (i.e. water consumed by food exports) is expected to be more of an environmental security issue in two to three decades. The indirect linkages between environment and security will continue to make this a difficult issue to address via public policy.

5.3 Global Change Science and Decision-making

Chair: William C. Clark (USA)
Rapporteur: Susanne C. Moser (USA)
Authors and Titles of Presentations:
Susanne C. Moser and David Cash (USA): *"Global change information for US coastal zone and water resource management: Linking institutions across scale and other boundaries"*
Alex Farrell (USA): *"Environmental protection in an industrializing, democratizing nation: Developing links between international, national and local air pollution institutions in Spain"*
Sandra Rothenberg and David L. Levy (USA): *"Corporate strategic reactions to climate change science"*

Key points of the discussion:

1. Assessment can be thought of as iterative, social communicative interaction processes, capable of linking science and policy, institutions across scales from the global to the local and vice versa, and the public and private sectors.

2. Assessment activities need improved mechanisms and incentives to engage various potential participants (industry, scientists, policy-makers, civil servants, other stakeholders).

3. Assessments and research create linkages across scale only in limited ways or cases, even though they are important as social and political processes; but political venues and economic policies may be more powerful in affecting and addressing environmental problems.

4. The relevance and credibility of assessments to particular users/participants depends in part on pre-existing relationships (e.g., industry-general public/market; NGOs-industry; NGOs-governments; public-scientific community).

5. There is a bias in assessment design (e.g., regarding participation) and in the study of assessment process to focus on the big (most vocal/visible) players while little attention is being paid to smaller players (e.g., mid-sized companies, transitional countries).

6. The study of assessments needs to pay more attention to the increasing role of democratizing institutions, to non-governmental organizations in linking the science and policy across scale and in raising awareness for environmental issues and in environmental governance.

7. Globalization is not only an important process affecting the environment, but also important in the emergence and spread of grassroots groups that concern themselves with the environment.

8. The absolute spatial extent of any particular scale of social organization (e.g., the physical extent of a nation state) differs widely from nation to nation (e.g., Japan versus the U.S.). Still, it is possible to define or discern scalar divisions in social organization. Scale related challenges (mismatch and cross-scale dynamics) are in principle the same, even though their spatial extent varies widely.

5.4 Business and Trade

Chair: Saburo Ikeda (Japan)
Rapporteur: Anoop Singh (Japan)
Authors and Titles of Presentations:
Maurício Mendonça and Marcelo do Valle (Brazil): *"Human Dimensions: International trade as a driving force to improve environmental technologies and production process"*
Ram Sharma Tiwaree (Thailand): *"Importance of ISO 14000 for trade and the environment in developing countries of Asia and the Pacific"*
Olaf Unteroberdoerster (USA): *"International trade in a dynamic Ricardian framework with transboundary pollution"*

Key points of the discussion:

*Questions (Q) / Answers (A) / Comments (C)

1. On Mendonça's presentation:
Mendonça's presentation touched upon the relation of trade to technological improvement in Brazilian pulp and paper industry. Brazilian firms have been able to shift to environmentally sound technologies like Elemental Chlorine Free/Total Chlorine Free (ECF/TCF) process.

Q1: Is it the case that foreign buyers will not buy the products of an environmentally unfriendly process?

A1: In the case of Brazilian pulp and paper industry, the main market is domestic rather than international. But these firms have committed themselves to adopt higher environmental standards. For example US environmental standards are adopted in Brazilian industry within a gap of 2-3 years.

Q2: What is the next possible candidate industry for adoption of environmentally friendly technologies in Brazil?

A2: I cannot say about other industries but it is expected other industries would also fall in line towards adoption of environmentally sound technologies.

Q3: I have this question concerning global warming issues. It seems that Brazil has not agreed about CDM or any other flexible mechanism.

A3: Negotiations on such environmental fronts could be based on political rather than pure economic interests. But domestic firms in Brazil would prefer change in the Brazilian approach towards CDM, since it can lead to transfer of environment friendly technologies.

Q4: What is the difference between the traditional pulp making technology and the ECF/TCF process technology in terms of cost of investment?

A4: In the beginning ECF/TCF technology was very expensive and hence many firms were not willing to switch over to this environment friendly technology. But now capital goods industry in Brazil provides only such environmentally friendly technologies and it is very difficult to find the old technology. Hence all new capacities are expected to be based on such environmentally friendly technologies.

2. On Tiwaree's presentation:

The presenter discussed the need for adoption of better production technology in developing countries of the Asia and the pacific region. He emphasized the adoption of ISO 14000 standards as a step towards environmentally responsive development.

Q1: It is very interesting to note that while the previous paper suggested that trade can lead to better environment but you suggested that trade can be also lead to deterioration of environment in the region you are studying.

A1: This is because industrial growth in developing nations of the Asia-Pacific region is usually through pollution intensive production processes.

C1: The Indonesian pulp & paper industry was not very responsive to environmental issues in 80s but they did catch up in 90s.

C2: ISO 14000 is not a quantitative target. It is more about existence of environmental planning in the plant. We can not give too much emphasis on ISO 14000 for improvement in environmental conditions in developing countries.

C3: FDI in SME enterprises in developing countries is not encouraged. Question is the transfer of environmental technology. FDI is limited to larger enterprises.

C4: SME cater to domestic market and hence are not interested in environmentally sound technologies. If large firms invest in EST, with access to large resources, marketing network and better technology, they may drive small firms out of the business.

C5: But in the Indian context, small firms contribute to about 40 per cent of total industrial output and more than 65 per cent to exports. Hence Indian small enterprises are very much outward looking.

3. On Unteroberdoerster's presentation:
Olaf presented a two-country trade model with transboundry pollution. Gains to trade between the two countries depend upon the transboundry nature of the pollution as well as the consequences of pollution on production activities.

Q1: How would the model behave if the trade itself depends on environmental conditions in the exporting country? I understand that there is no Input-Output kind of linkage in the model.

A1: Presently the model is kept very simple and there are many possibilities to be accounted for. But that would make the model complex. Consumption behavior can also be modeled in a more rigorous manner.

Q2: What would be the results of your model if it can scale up to a world trade model?

A2: Yes, it can be transformed to include many countries. But that would increase the model complexity and results may not be easily interpretable due to the complex nature. It can also be turned into a North-South model to see if production activities could shift to other regions as a result of environment considerations.

Q3: Do you see a change in WTO policy on free trade?

A3: There are different issues to be looked in this respect. The WTO is a rather legalistic body. It would take time before legalists can include environmental considerations.

5.5 Health

Chair: Xavier Baulies (Spain)
Rapporteur: Daniel Hogan (Brazil)
Authors and Titles of Presentations:
Samarajalingam Shanmuganandan and David Phillips (India/UK): *"Global environmental change and its impact on human diseases in a tropical environment: A case study of India"*
Joan Kagwanja, Robin Reid and Brent Swallow (Ethiopia): *"Disease control-human migration-environment interactions: An assessment of the impacts of trypanosomosis control"*
Milind Kandlikar, G. Ramachandran and Ambuj Sagar (USA): *"Health risks from airborne particulate matter in megacities of India: Uncertainties and the hazards of extrapolation"*
Mykola Fuzik (Ukraine): *"Assessment of risk of thyroid cancer development in different groups of population affected after the Chernobyl accident"*

Key points of the discussion:

1. Four issues related to health and climate change were discussed: (1) a general discussion of the impact of global environmental change (various changes) on disease (a detailed survey of different diseases and health conditions) in India; (2) the social, environmental, economic and demographic consequences of controlling sleeping sickness in cattle in Ethiopia; (3) a review of the effects of air pollution (rural/urban, house-hold/ambient) on health, with reference to India; and (4) a report of the incidence of thyroid cancer in areas of the Ukraine and Russia, following the Chernobyl accident.

2. Debate drew attention to two major links the effects of environmental change on health in the HD question: the effect of environmental change on health and the effects of land-use changes leading to environmental changes, with impacts on health. The two Indian studies combined wide-ranging reviews of the environment/health link, which showed the actual and potential impacts (33% of vector-borne diseases are related to vector-borne ecosystems, for example) and

the very considerable gaps in our knowledge of this link. The two studies on specific diseases showed how empirical work on concrete issues can be conclusive. The Ethiopian study clearly laid out the complex inter-relationships among disease control, migration and land use. The Ukraine study, while a careful epidemiological analysis, did not relate the issue to wider concerns for food, security, political and/or economic consequences.

3. The current diversity of diseases in the world is unprecedented in history. Once-controlled diseases such as Malaria, dengue fever and cholera, have been re-introduced and have increased in frequency. Many vector-borne diseases, furthermore, will increase with rising temperatures. Nevertheless, the knowledge base on which these (and other) assessments are based is not systematic: much of the literature is on local case studies; protocols for diagnoses and registration differ among countries; and there are many gaps in the health link causal chain.

5.6 Qualitative Approaches to Integrated Assessments of Land Use and Land Cover Change

Chair: Roger E. Kasperson (USA)
Rapporteur: Jeanne X. Kasperson (USA)
Authors and Titles of Presentations:
Fritz Reusswig (Germany): *"Transdisciplinary land use and land cover change analysis by syndromes"*
Gerhard Petschel-Held (Germany): *"New tools for transdisciplinary research in land use and land cover change"*
Roger E. Kasperson (USA): *"Trajectories of regional land use changes-Integrating qualitative information in global change research"*

Key points of the discussion:

1. This session presented findings from two large-scale, international, and interdisciplinary projects that addressed the role of global environmental change in determining environmental criticality of regions across the globe. Both projects used integrative frameworks to try to identify "hot spots" or "regions at risk" of becoming environmentally critical.

2. The first project, based at the Potsdam Institute for Climate Impact Research, sought to bridge the gap that separates global models and case studies of global environmental change by enlisting "syndrome analysis" to detect typical patterns of nonsustainable civilization/nature interactions. Researchers have identified some sixteen of these syndromes, and, using a combination of global data analysis, Fuzzy logic, qualitative modelling, and GIS, have come up with a map that identifies which regions of the world are likely to be vulnerable to the impacts of various types of global environmental change. A fourfold classification-HOT, WARM, MIXED, GOOD-serves to locate each region in terms of its sensitivity to ongoing or expected global change.

3. The second project, centered at Clark University in the United States, conducted integrated regional assessments of nine potentially critical environmental zones. Using a common protocol, case-study teams set out to characterize their respective regions in terms of "trajectories of threat" attendant on global environmental change. Looking at a series of indicators-environmental degradation, wealth, well-being, economic and technological substitutability, spatial linkages, and societal capacity to respond-over a fifty-year (or more) time span, researchers were able to designate their regions as environmentally critical, endangered, impoverished, or sustainable. Comparative analysis of the case studies suggests that;

   * Extensive intermingling of social and economic change with environmental degradation

hampers the attribution of causality, scientific capacity to narrow uncertainties, and management responses to "environmental problems"

* Apparent regional prosperity, often owing to the "export" of degradation to other places or future generations, often marks the extent of degradation

* Technology is a key to defining the ecological limits of a region. (e.g., The Basin of Mexico may be approaching such limits.)

5.7 Land Use and Land Cover Change: Case Studies

Chair: David Barton Bray (USA)
Rapporteur: Ronald Nigh (Mexico)
Authors and Titles of Presentations:
Sven Schade (Germany): *"From cattle to seed beans - Who benefits from land use change and changing institutions in resource administration in Northern Tanzania?"*
Alicia Iglesias and Marta Kollmann (Argentina): *"Environmental desertification in Argentine Patagonia: Social dimension of use and soil cover"*

Key points of the discussion:

Only two of the scheduled papers were presented. Disucussion was held after each paper.

*Questions (Q) / Answers(A)

1. Discussion of paper by Sven Schade

Q1: Is there a system of traditional land tenure rights among the Massai ?

A1: Traditionally only water rights were recognized, based on clan relationships. Under the modern system there is a 99 year lease of lands for specific uses, but this is largely unenforceable. Corruption allows private ownership.

Q2: Were there formerly institutions of natural resources management?

A2: In some areas the village council, working through parallel structures such as the local committees of the Unity party. Currently there is a low level of participation ; the village council is not seen as important by traditional leaders.

Q3: Is there danger of losing traditonal rights to permanent water holes?

A3: At present I do not see any danger of that.

2. Discussion of paper by Marta Kollmann

Q1: What about the "biological facts" concerning drought in the area?

A1: We have a multidisciplinary team that includes biologists and we have complete information on the biological aspects. On consulting with local people we find that they blame the desertification on global climate change rather than grazing practices.

Q2: Who are the main actors in this process?

A2: Ranchers. There are few of them (around 1500).

5.8 Attitudes and Behaviour: Citizens

Chair: Hans Spada (Germany)
Rapporteur: Michael Scheuermann (Germany)
Authors and Titles of Presentations:
Patricia Romero Lankao (Mexico): *"Driving forces of the agents activities and environmental change illustrated by Mexican managers and peasants"*
Pham Thi Mong Hoa (Vietnam): *"Ethnic minorities and environment in Vietnam"*
Granger Morgan, Kara Morgan, Mike Dekay, Keith Florig, Paul Fischbeck and Baruch Fischoff (USA): *"Citizen participation in risk ranking"*
Karl-Heinz Simon (Germany): *"Analyzing modes of consumption and change options-the case of food and agriculture in a process chains perspective"*

Key points of the discussion:

1.

* Driving forces in the two groups of the study (managers, peasants) have different patterns. Prices and demographic factors are significant drivers of the agent's production patterns.
* Values and beliefs are more important than material conditions.
* Driving forces as international tracing or labour market have an impact, but cannot explain why peasants have to work under these adverse conditions.

2.

* There are big differences between the ethnic majority and the ethnic minorities in land use patterns (concerning shifting cultivation)
* Education and governmental propaganda on environmental behaviour had a major impact on the ethnic minorities, but there still is a lot of resistance to change life style.
* The nutrition status increases if people stop using shifting cultivation. Living conditions improve step by step.

3.

* Participation of lay people is successful in the area of traditional health, safety, and environmental risks, but much more difficult with life style issues.
* People should be lightly involved in the risk ranking process to ensure good results. It is not enough to ask stakeholders their opinion.

4.

* The question is if the presented approach is data based or a true modeling approach and whether it is supply driven or demand driven.
* Electronic shopping will have a strong impact on the transport system, making it more efficient.
* The data base of this study and the computer program are accessible via the web, most of it yet in a German version.

Session 6

6.1 Human-Environment Interactions

Chair: Anand Prabhakar Patwardhan (India)
Rapporteur: Ko Nomura (Japan)
Authors and Titles of Presentations:
Christopher Vanderpool and Craig Harris (USA): *"Human dimensions of long term ecological research on agroecosystems"*
Osamu Abe and Bishnu Bhandari (Japan): *"New global civilization and environmental education"*
Juan Manuel Rodrígez Estéves, Ádriana Alvarez Andrade and Araceli Almaraz Alvarado (Mexico): *"EL Niño effects in the northern border of Mexico: Urban and natural processes in six border counties"*
Takashi Hattori (Japan): *"Integrating policies for combating with climate change: A case study of the Japanese interministerial coordination for the Kyoto Protocol"*

Key points of the discussion:

1. How the people have dealt with vulnerabilities to the effect of EL Niño?

2. How the local authorities have responded to the result of this research?

3. How transparent the Japanese decision making process is?

4. Whether there were any trade-offs between actors related to COP3?

5. How "Modeling" is effective in researching human-environment interactions?

6.2 Resources, Security and Adaptation II

Chair: Steve Lonergan (Canada)
Rapporteur: Susan Hendy (Japan)
Authors and Titles of Presentations:
Meg Keen and Chris Cocklin (Austria): *"Urbanisation in the Pacific: Resources, security and adaptations"*
Richard Matthew (USA): *"Infrastructure, ecostructure and human security"*
Vladimir Kotov (Russia): *"Crime versus environmental security in Russia"*
Stacy Van Deveer and Geoffrey Dabelko (USA): *"Regional environmental security: The case of the Baltic"*

Key points of the discussion:

1. An inquiry was made as to whether tourism was making a big impact in the small Pacific islands, either by contributing to urbanization or making them more ecologically susceptible. The answer was yes, especially with the destruction of coral reefs and mangroves and the golf courses in the many resorts, notably in Fiji.

2. It was pointed out that although high poverty was a problem in these areas, this was relative to the Pacific, and not on the level of poverty in some areas of Asia or Latin America. The phrase "particular vulnerabilities of small island states" is used often and perhaps overstated, and in

particular the islands themselves promote this idea in order to secure a strategic advantage in climate change issues.

3. There was some mention of the fact that, although these islands are often lumped together in the same group, they are all very different.

4. After the presentation on systems modeling, the various problems with the models were highlighted, for example with calibrating them. Starting from scratch would be too difficult and time-consuming and it will be important to look at previous models and especially where they have gone wrong. It was emphasized that this project is still in the developing stages.

5. On the subject of environmental security in the Baltics, there was a question as to whether institutions are diminishing the power of the ministers, as in Canada and the United States. The answer was that this was not a big problem because the system is slightly different.

6. There was an inquiry into whether there has been backlash against the use of the phrase "environmental security" as it could be used as an excuse for more power struggles. However, there is not a military legacy in this area like the one in the United States.

7. There was considerable discussion on the issue of real threats versus perceived threats. Although in many Baltic countries Russia is perceived as the major threat to national security, the actual real threat is unknown. Furthermore, this is often used as a policy to secure more aid. For example, if Norway can convince the major European nations (England, France, Germany, etc) that they are under severe nuclear threat from Russia (even if this has no basis in reality), they can secure aid and use it for other purposes.

6.3 Towards the critical evaluation of global environmental assessment

Chair: Oran R. Young (USA)
Rapporteur: Nancy Dickson (USA)
Authors and Titles of Presentations:
Sheila Jasanoff (USA): *"Shaping knowledge, defining community: Global environmental assessment as a communication process"*
Jill Jäger, Alex Farrell and Stacy VanDeveer (Austria/USA): *"Consensus and dissent in global environmental assessments"*
William Clark, David Cash and Susanne Moser (USA): *"Linkages across scales in managing global environmental issues: Assessments as information and decision support systems"*
Robert Keohane, Ronald Mitchell and Barbara Connolly (USA): *"Global environmental assessments as general information institutions: The role of information in international relations"*

Key points of the discussion:

The session presentations addressed the following topics:

1. The Global Environmental Assessment Project (GEA) project views assessment as a dynamic, social process of communicating among multiple producers and users of assessments.

2. Key issues in assessment design that are important include: the framing of an issue; participation in the assessment process; the institutional context in which the assessment takes place; and the science/policy interface.

3. Distributed assessment systems are a polycentric, but integrated system of research, assessment and management which cut across numerous scales (subnational, sectoral, local) and include dynamic, adaptive and iterative interactions between scientists, decision makers and stakeholders.

4. Challenges for better assessments include building national and regional capacity for research and assessment that can reach "up" to the best of the international science and technology; reach "down" to trusted local institutions and through them, to local decision makers.

5. The negotiation and institutionalization of "boundaries" separating science and policy in assessments affect their credibility and legitimacy.

6. The effectiveness of GEAs is influenced by the ways in which GEAs are structured to deal with participation, scientific uncertainty, and the treatment of dissenting views.

7. Effective assessments deliver value to the changing needs of specific users and producers of assessments; their technical arguments are credible to the relevant communities; and the process is legitimized by stakeholders.

Key points of the discussion focused on:

1. The tensions between a management oriented perspective of assessment and a social theory of assessment.

2. How effectiveness of an assessment process can be measured, including changes in the behavior of states, changes in the framing of an issue, changes in the disciplines of the people dealing with a problem, and changes in agendas.

3. The difficulty of addressing participation issues. There are tradeoffs between the credibility and legitimacy of an assessment depending on who participates.

4. The role of international organizations for providing legitimization of assessments as a neutral ground for conducting an assessment and for continuity of the assessment process is critical. (The long-term development of the RAINS model was contrasted with the short planning horizon for the IPCC.)

6.4 Tri-Academy Project : Interactions of Population and Land Use

Chair: Cynthia Rosenzweig (USA)
Rapporteur: Roger E. Kasperson (USA)
Authors and Titles of Presentations:
Zhao Shidong (China): *"Population and land use change in Jitai Basin and the Pearl River Delta, China"*
P. S. Ramakrishnan (India): *"Population and land use change in Haryana and Kerala States, India"*
William D. Solecki (USA): *"Population and land use change in South Florida and Greater Chicago, United States"*
Cynthia Rosenzweig and Gordon (Reds) Wolman (USA): *"Population and land use change: A comparative analysis"*

Key points of the discussion:

This session was entitled: "Tri-Academy Project: Interactions of Population and Land Use." The

project is a joint effort of the Chinese, Indian, and U.S. Academies of Science to understand the relationships among population, land use, and consumption at selected sites in the three countries. Two core areas have been studied in each country over a forty year period, and the changes over time and important contributing factors have been examined.

Important issues discussed in the session included:

1. Does rapid economic growth accompanied by massive urbanization necessarily result in severe environmental contamination? If not, what policies are most effective?

2. What types of impacts does rapid urbanization have upon nearby agricultural lands, and on agricultural biodiversity?

3. How have government policies affected the types and rates of land use and cropping changes?

4. How does the "openness" of the region affect the interrelationships between population, consumption, and land use? What effects fallow increasing integration?

5. How does infrastructure development affect patterns and processes of land conversion?

6.5 Land Use and Land Cover Change: Climate Feedbacks

Chair: Mikiko Kainuma (Japan)
Rapporteur: Hideo Harasawa (Japan)
Authors and Titles of Presentations:
E. Shevliakova, N. Andronova, M. Schlesinger and H. Dowlatabadi (USA): *"Influence of changes in land use and land cover on biophysical feedback to climate"*
Helmut Haberl, Karl-Heinz Erb and Fridolin Krausmann (Austria): *"Colonizing landscapes: Land-use induced changes in ecological energy flows and consequences for biomass and carbon storage in the aboveground vegetation - The case of Austria"*
Toshiaki Ichinose (Japan): *"Climatological impact of land use change during recent 150 years in Japan"*
Bambang Hero Saharjo (Indonesia): *"The role of human beings in disturbing environmental conditions from the view point of forest fires - A case study in Indonesia"*
M. Granger Morgan and Louis F. Pitelka (USA): *"Impacts of climate change on forest land cover: an expert elicitation of terrestrial ecologists"*

Key points of the discussion:

*Questions (Q) / Answers (A) / Comments (C)

1. On Shevliakova's presentation:

Q: Is the figure on sensible heat a global value?

A: No. It is just a location, 105E and 5 S. One cell (1 degree times 1 degree latitude and longitude) in the Asian Region.

2. On Haberl's presentation:

Q: Methodology to calculate NPP?

A: Using digital elevation model (altitude data), regression analysis was applied. Huge difference between potential NPP and actual data especially in peripheral area.

3. On Ichonose's presentation:

Q1: Was aerosol considered in calculating temperature?

A1: No.

Q2: What is major cause of temperature increase in large urban areas?

A2: Change of heat balance. In the case of Tokyo, 2-degree centigrade increase is calculated. One degree is due to surface change (land use and cover change) and 1 degree is due to heat emission growth in the urban area.

Q3: From the study, is there any suggestion of movement of the national capital?

A3: North Kanto is appropriate from the analysis because in this region ventilation of urban atmosphere can be expected. It will makes the capital area cool.

4. On Saharjo's presentation:

C: Sumitomo Forest company is now doing some experimental works in the country for sustainable forestry.

5. On Morgan's presentation:

Q: There is a set of questions. Are some questions new? Significant difference in variance. What is cause?

A: Yes. Climate scientists' variance on vegetation is very tight. This is because they rely heavily on model results. Climate scientists know each other and their research very well (even precise figures). 15 years ago the same research was done with the health experts.

6.6 Valuation of Ecosystem Services

Chair: Bernd Kasemir (Switzerland)
Rapporteur: Douglas McGlone (the Philippines)
Authors and Titles of Presentations:
Gbadebo A. Oladosu, J. Shortle and J. K. Lazo (USA): *"Valuing outdoor recreational impacts of climate change in a regional non-market computable general equilibrium model"*
Mizue Ohe and Kami Seo (Japan): *"The environmental costs of growth: Public perceptions and environmental evaluation of impacts on the forests"*

Key points of the discussion:

1. Concern was expressed regarding the inclusion of a labor-leisure tradeoff, and the link between changing recreation demand and changing habitats. It is felt that the CGE model is flexible enough to incorporate these concerns.

2. A question was raised regarding some values being based on willingness-to-pay measures, and others on willingness-to-accept measures. This is a result of a property rights assumption; that the consumer has a right to the original state of the environment.

3. Questions were raised concerning the advantage of willingness to lower standard of living (WTLSL) over willingness-to-pay (WTP) in the survivers. It is felt that WTLSL is a more acceptable measure in Japanese culture, in that it implies more social participation.

4. Concern was raised over the preponderance of male respondents in the survey, a previous survey of females indicates that females are more likely to accept a greater reduction in WTLSL, so that the survey presented may have a downward bias for social WTLSL.

6.7 Regional Environmental Risks and Risk Perception in Asia

Chair: Hiroshi Kojima (Japan)
Rapporteur: Michinori Kabuto (Japan)
Authors and Titles of Presentations:
Michinori Kabuto and Yasushi Honda (Japan): *"Status and perspectives towards the early 21st Century of the 'Environmental Risk Transition' in relation to awareness and perception of the environmental risks in Asian countries: An overview of our HDP approach"*
Ml Zulkarnain Duki, Shosuki Suzuki, Tomoyuki Kawada, A. Tri Tugaswati, S. A. Denita, S. Sudarmadi and N. Herawati (Japan / Indonesia): *"Dose-response of air pollution and the economic cost: A case study of students and their parents in Indonesia"*
Ryutaro Ohtsuka, Kazuhiko Moji, Tsukasa Inaoka, Kazumi Natsuhara, Makito Minami, Takeshi Sakurai and Michinori Kabuto (Japan): *"Primary health and environmental care in rural areas of South Asian countries"*

Key points of the discussion:

1. Three speakers presented each of the papers basically according to the abstracts. Dr. Honda, the first speaker, introduced the project (1997—1999) as a whole and a brief summary of the survey results in four cities in China. Conclusively, it was noted that nutritional status was evaluated to be satisfactory in the subject cities regardless of income status. More detailed analyses wait for a whole for clean-up of the obtained data.

2. Mr. Duki introduced their analysis results for the data from the three cities in Indonesia. As a whole, he tried and seemed to have succeeded in demonstrating the dose-response relationship between NO_2 in the air and respiratory symptoms, the cost for disease treatment or the WTP (willing-to-pay) methods.

3. Finally, Dr. Ohtsuka overviewed the demographic profiles in South Asia and introduced the preliminary survey results, first emphasizing the importance of Primary Health Care (PHC) and Primary Environmental Care (PEC). In general, villagers were much more concerned about forests and less about air and water problems in Bangladesh. The literacy rate was very poor, and poverty and joblessness were serious. Malnutrition was associated with soil degradation and deforestation. He added source information about the arsenic pollution of water and its possible effect (melanosis and keratosis) on the large population.

Poster Session and Demonstration

Poster Session and Demonstration

Time/Date 14:00-15:00 June 25, 1999 (Posters were exhibited during the whole period of the meeting.)

Venue Conference Lobby, Shonan Village Center

Throughout the meeting, posters by eleven authors were exhibited in the lobby of Shonan Village Center, and the authors had a chance to explain their posters on the afternoon of the second day. A computer demonstration was also conducted at this time. There was a large audience in the lobby during this period, and the authors of each poster answered questions and and discussed their work with the audience. The abstracts of the posters are also included in the Abstract Volume.

Poster Session

Suresh Chand Rai (India): *"Land use change and hydrology of a Himalayan watershed"*

K. S. Rao and Rekha Pant (India): *"Land use/land cover changes in Sadiyagad watershed in Kumaon Himalaya -the sustainable livelihood options"*

A. C. Chipanshi and K. Tlhalerwa (Botswana): *"Refrigeration and CFCS in Botswana: the Gaborone case study"*

Wang Shaoqiang and Zhou Chenghu (China): *"Impacts of land-cover changes on terrestrial carbon cycle in China"*

Jianxin Gong (China) and Kuninori Otsubo (Japan): *"GKSIM: a new model for projecting land use change in long-term"*

Myron P. Gutmann, Andres Peri, William J. Parton, Ingrid C. Burke and Glenn D. Deane (USA): *"The transformation of land from agricultural to non-agricultural uses in the U.S. Great Plains"*

Stanley D. Brunn and Shannon R. O'Lear (USA): *"Scholarly networking in the Human Dimensions of Global Change Research Community"*

Natalya Abdrashitova (Kyrgyzstan): *"The present condition of the walnut-fruit forests of Kyrgyz Republic"*

Sachio Kubo (Japan): *"Monitoring urban heat island"*

Taibi Aude Nuscia and El Hannani Mustapha (France): *"Changes in land use and human management and their impact on degradation in two presaharian piedmonts by remote sensing"*

N. C. Gautam and V. Raghavswamy (India): *"Land use/land cover change due to human dimensions: a case study of north-east India"*

Demonstration

Hideki Kaji, Hidehiko Kanegae, Kenichi Ishibashi and Toshiyuki Kaneda (Japan): *"Sustainable Development Planning in Simulation and Gaming"*

Closing Session

Chair: Jill Jäger
Co-chair, ISPC of the 1999 Open Meeting (Austria)

Speaker: Uno Svedin
Swedish Council for Planning and Coordination of Research (Sweden)

Speaker: Eckart Ehlers (a member of ISPC of the 1999 Open Meeting)
International Human Dimensions Programme on Global Environmental Change (IHDP) (Germany)

Speaker: Shuzo Nishioka
Co-chair, ISPC of the 1999 Open Meeting (Japan)

Time/Date 17:30-18:30 June 26, 1999

Venue Dazai-Hall, Lofos Shonan

The Closing Session was chaired by Dr. Jill Jäger, co-chair of the ISPC. Speeches were given by Prof. Uno Svedin of the Swedish Council for Planning and Coordination of Research, and by Dr Eckart Ehlers, the Chair of the Scientific Committee of the IHDP. After the speeches, the chair solicited evaluations of the meeting from the audience, and there was an interesting and useful discussion. The meeting ended with a closing speech by Dr. Shuzo Nishioka, co-chair of the ISPC.

Concerning the administration of the Open Meeting, two comments were made by the participants: 1) The number of themes and parallel sessions should be reduced, so that more time can be spent on one presentation, and that there can be effective discussion in the sessions, 2) The selection of the papers should be made more strictly from the content of the whole paper, and not from the abstract, in order to improve the quality of presentations.

Following these comments, discussion on three points followed: 1) Because Human Dimensions research includes so many fields, the purpose of the Open Meeting was to promote exchange of opinions between different fields, and to have various kinds of presentations from as many fields as possible. 2) Unlike the previous meetings, an overall impression of the Open Meeting could be obtained from the book of abstracts. If submissions of whole papers were to be made instead of abstracts, it would consume too much preparation time and expense and defeat the purpose of making the meeting as inexpensive and practical as possible. It would also result in a decrease in participation of young researchers and participants from developing countries. 3) If the objective of the meeting is to keep it open to everyone, and have large participation, what we had at this meeting satisfied that objective, and the majority of participants agreed that the bottom-up approach used to organize the Open Meetings results in stimulating and highly useful events.

The contents of three speeches are given in the following pages.

Closing Remarks

Uno Svedin

Professor, Swedish Council for Planning and Coordination of Research

Dear colleagues, in addressing you at this final stage of the world conference here at Shonan Village, I feel greatly honored in trying to encompass some things that has happened during these days and reflect somewhat on that content. At the same time, there is a feeling of a heavy load of responsibility to provide just my own subjectivity at this event as the ultimate contribution. Whatever the situation may be, here are the remarks. Some of the few just one-hour old hand-written overheads are shown just to indicate to you a sort of real-time-ness of the impressions I am presenting to you.

Which types of questions could you then think of addressing at this closing session of the world conference. Of course, you can always ask 'has the conference been a success or not'. Indeed, we have all benefited highly from this dynamic and well-planned event. Just to indicate a few criteria on which to judge that; the "excitement of topics" rating is high, the "informal contact possibilities" rating is high, the "administrative smoothness" rating is high. We owe, indeed, all those in the planning machinery great thanks for their skills, effort and devotion and that holds also true for all the persons who have done all the work behind the scene during the conference days.

Having said this, I think an equally important question concern the interpretation of this event in relation to the earlier events in the sequence starting at Duke University in 1995, then continuing at Vienna in 1997 at IIASA, and now here in Japan at Shonan Village. The sequence has spanned half a decade and if you take into account all the work that did build up the momentum before Duke, we have a time window of a decade. What do we see in terms of dynamics over this time? When we look at the sequence of world conference events, and there are some here together with me who belongs to the little club of those who have had the benefit of participating in all the three events, what do we see?

Let's compare our notes to see if we can move towards a common assessment of the situation. At Duke, the setting of a certain repertoire of themes was one of the major contributions. Maybe even more importantly there was a sort of legitimization at the limited but still international level of the human dimensions topics as such and not the least as a connected and combined internationally area of study. At IIASA in Vienna, there was an opening up to the world in more than a formal way. The events in Vienna pointed also at the strongly emerging international constituency in this field, but the scope of the international participation at the conference itself was still limited basically to Northern America and Europe. Here at Shonan Village, the demonstration of the global reach of the human dimensions theme has been strongly highlighted. The consolidation of many activities in a qualitative sense since Vienna is also visible. But also the further demonstration of the gradual establishment of a highly international community of researchers as well as the widening of the group of human dimensions stakeholders has been visible.

But there are some questions you have to ask about the sequence. Instead of seeing this process as a spread of momentum from the Duke event and further on, it could be seen as a successive illumination of since long already ongoing activities of more or less local or national nature both in terms of topics but also encapsulated in a wide variety of non-universal languages. I am thinking about a comment earlier made this week from one of the scholars from Nigeria on this topic. So what we see within the sequence of these world conferences is the sweeping of the torch over the countries in the world stepwise illuminating different experiences.

However, we should also recognize that at the same time there is a gradual consolidation and legitimization process going on concerning the *international* relevance of the topics we are concerned with.

I also think it is fair to note, which, of course, is a subjective statement, the gradual quality enhancement of the contributions taken in a collective sense. Quality in what sense? What do I mean by this indication of an emerging maturity in a growing new field of investigation? I am thinking about a sort of sophistication in the argumentation. There are the chains of arguments and counter-arguments, but also higher levels of complexity in the treatment of the discourses. There is also a sense of a second round of activities with regard to the treatment of topics earlier dealt with, including some sort of growing consolidation of the first order of early ideas. There also seems to exist a more elaborated homework in terms of the connection between theory and the empirical data basis. Much has been done through hard work, the results of which have been beautifully demonstrated at this conference. So since last time we have seen a further growth of the human dimensions international community in terms of the size of the community, the participants here being the top of the iceberg, the geographical distribution and the scientific emerging maturity of all these activities.

Where then are the pointers to the future?

Here I have seven points. There is a direction of the further need to "go South" in a very symbolic meaning of the word. By opening up for the activities of "the South" in a participatory sense other things may follow. There may emerge a more profound probing of so far deeply cherished idea of the present way in which questions are posed, as well as for whom they are raised. Secondly there may be new avenues emerging in which way methods-wise these issues could be addressed. Thirdly, I also think that the further pluralization of issues and the presence of a growing diverse set of stakeholders will transform many of the discourses that are now under development. This may also be a challenge, as there is an underlying issue of democratization of the agenda setting that is still basically only lightly touched upon. Fourthly connected to this, there may be reasons to re-introduce the issue of the role of dissent at this stage, as there is a questions in the field of balance between on the one hand promotion of further convergence and on the other hand the need of continued pluralization with regard to certain issues. Fifthly, the matter about moving the natural science and the social science and humanistic approaches closer to each other must been seen in the light of what I have said in the earlier points. It is necessary to close the gap but the conditions under which this merge is to be done is still to be worked on. And this should not be done in a hegemonic fashion from either side in any of the thematically realms open for enquiry.

The necessity to close the gap between the natural science and the social science aspects is also - and this is the sixth point- driven by the pressure for increased relevance of the research activities for use by the policy world when at the same time the community of international scholars need to reaffirm the critical mandate of independent advice. This brings me to the last and seventh point, i.e. the further need for synthesis work. I here include the need to further develop the ongoing work to connect different globalization discourses that we have already seen interesting examples of here at the conference. The further improvement of maybe new forms of "integrated assessment", including reflections around their institutional and cultural embeddings, will be needed to build the links to the policy worlds.

So, as has been made visible before our eyes here at Shonan Village, the community has already come a long way, but it still faces demanding challenges ahead. It is now time to say thank you to the organizers, to all of you, it has been exhilarating to be here, it has been highly memorable. Again, thanks.

Closing Remarks

Eckart Ehlers

Chair, Scientific Committee, International Human Dimensions Programme on Global Environmental Change(IHDP)
Professor, University of Bonne

Ladies and gentlemen, dear colleagues and friends. Thank you very much for giving me the opportunity to say a few words at the end of the 1999 Open Meeting. It gives me the opportunity to thank, not only on behalf of IHDP but I think in the name of all of you, IGES, the Government of Japan with its Environment Agency and APN. I would also like to thank the Co-chairs of the Organizing Committee, Dr. Jill Jäger and Dr. Shuzo Nishioka. Deep-felt gratitude also goes to all those who have been working behind the scenes, not only the local organizing committee but all those who have contributed to the perfect organization, a wonderful setting, a meticulous hospitality and an impressive scientific program. From now onwards, Shonan Village will be remembered as a milestone in the development of human dimensions research on global environmental change.

The fact that this meeting has not only shown a maturing of human dimensions research but also a distinct consolidation of the human dimension research community gives me a welcome opportunity for a look into the future of both human dimension research in the field of global environmental change in general and the role of IHDP in the Asia-Pacific region. I will do so in two regards. First, organization and second, science. I think there is a growing awareness in the social science community of both the necessity and the value of global environmental change research issues. On the one hand, one cannot deny the fact that social sciences so far play only a small role in decision-making processes about global environmental change policy. On the other hand, I think there is a demand for solid, problem-oriented and problem-solving social science research and that this demand is growing. We need to cope with this demand. This necessity is articulated quite outspokenly not only by the International Geosphere-Biosphere Programme (IGBP) and its representatives but it gains unprecedented momentum by the fact that the human domination of the earth's ecosystem has reached such an extent that some scientists even speak of an human-dominated, anthropozoic geological era we are living in.

Ladies and gentlemen, unity gives strength. In order to take up the opportunities that are lying ahead of and for the social sciences, in order to meet the challenges that global environmental change research offers to the social sciences and in order to come up to the expectations that people and the public have towards the social sciences, I urge those of you that have not done so far, toorganize yourselves in national or regional committees on human dimensions research. Bundle your energies and work together in the field of global environmental change researchers. The creation and organization of national or regional committees seems to me to be an indispensable pre-condition not only for a stronger visibility of the social sciences in the field of global environmental change research but also a stimulus for closer cross-disciplinary cooperation and the discovery of mutual interests in the wide field of social sciences.

IHDP -- and now I am speaking in my function as Chair of its Scientific Committee -- has, of course, strong and well-defined interests in the creation and development of national or regional committees and is willing to help in the establishment of these or similar institutions. I want to take this opportunity to repeat IHDP's basic philosophy that we will never interfere with national science communities with their own priorities for research. But we do have a strong interest in their general development, because we have an interest in the development of international networks of human dimensions researchers and especially of those who are in working in applied

and applicable fields of this research. And to be quite frank, we need national committees in order to be able to provide input to the international programme and to legitimize our own internationality. Our name is **International** Human Dimensions Programme and our role is to help to disseminate local and national research results, to establish regional networks, to focus on problem-related themes and topics of societal relevance and to increase the international awareness of the contributions of the human dimensions community to the solution of global environmental change problems that are affecting us on local, regional and or global levels. I want to take this opportunity to let you know about two very recent events. The first is that the United States has agreed to support the International Human Dimensions Program over the next three years with a considerable amount of money, not enough to enable us to do all that we want to do but sufficient to develop further specific projects beyond their present stage. Second the core funding from the German government for the IHDP Secretariat in Bonn has been assured.

Now the second aspect: science. I would like to make a few suggestions about the future scientific challenges for the human dimensions of global environmental change research community. Without claiming comprehensiveness, these challenges include three aspects from my perspective. **First**, a stronger necessity to focus on the generalization potential of the many valuable local or regional case studies. We can reach such a generalization potential by transferring description into analysis and wherever possible into an analysis which is quantifiable. In order to lay foundations for modeling approaches and for helping to develop a broader analytical framework for the future, we have to combine these approaches with other models. To enhance trans-disciplinary work is necessary also with regard to the other fields of science. **Second**, modeling. Modeling includes the question of scale. We are all aware that social sciences tend to work on local or regional levels while the natural sciences, in the past at least, preferred the global approach. And therefore, local-regional is identified with social or cultural science, while global is the domain or has been the domain of natural science. On the other hand, there is a growing awareness that we need to develop methodologies for dealing with the different levels. While IGBP and the natural sciences increasingly demand for downscaling of their global models to regional models, I think IHDP and the social sciences may be well-advised to develop at least small-scale models to allow interactions with the natural sciences and to increase the applicability of their own research beyond specific case studies and to enhance their problem-oriented and their problem-solving potential.

Third and last, globalization. Globalization, characterized by the shrinking of time and space, by new neighborhoods in a diminishing world but also new fragmentation, has become very clear during this conference through the revival of identities, traditions and cultures. Global environmental change research by social scientists therefore has, in my view and my full conviction, the task to ensure cultural diversity issues with special reference to ecological as well as economical North-South and East-West responsibilities. Due to increasing human domination of earth's system, it is social scientists' task to ensure that also in the future, natural and cultural richness and diversity remain part of our planet's character.

In 1998, Edwin O. Wilson published his much debated book, '**Consilience**. The unity of knowledge' arguing in favor of a more holistic and integrative approach toward the solution also of environmental problems and toward the "rapprochement" of natural sciences and social sciences theories and methodologies. His ultimate plea for a total consilience of all academic disciplines will probably be difficult, if not impossible, to fulfill. However, the idea is an intriguing one and at least worth serious consideration. While we are far away from this goal, I repeat, Shonan Village and the third Open Meeting has been a significant step forward and I guess all of us are looking forward to the future consolidation of our research community with its ultimate goal to contribute not only to a better understanding of the earth system but also to its maintenance and improvement wherever necessary. Thank you very much.

Closing Remarks

Shuzo Nishioka

Co-chair, ISPC of the 1999 Open Meeting
Professor, Keio University
Project Leader, Institute for Global Environmental Strategies (IGES)

Thank you very much, Chair, for your kind introduction. After that heated discussion, I would now like to introduce the Japanese art of "tea ceremony" to cool ourselves down. The "tea ceremony" is a traditional art of drinking tea in a ceremonial style. There are different schools for practicing the "tea ceremony", each with slightly different rules and ways of serving the tea. Rules are different in very small details, such as when to eat the cake, where to put the spoon, when to bow and so on. However, there is a famous Japanese poem that explains about the relationship between the different schools and the universal spirits of tea. The meaning of this poem is that no matter how you serve the tea, the intention of all is to enjoy the cup of tea and the calmness it brings to you. This is the universal spirit of the "tea ceremony". In the past three days, we have approached through so many different ways to climb the mountain, and hopefully, have discovered the common peak (Figure 1).

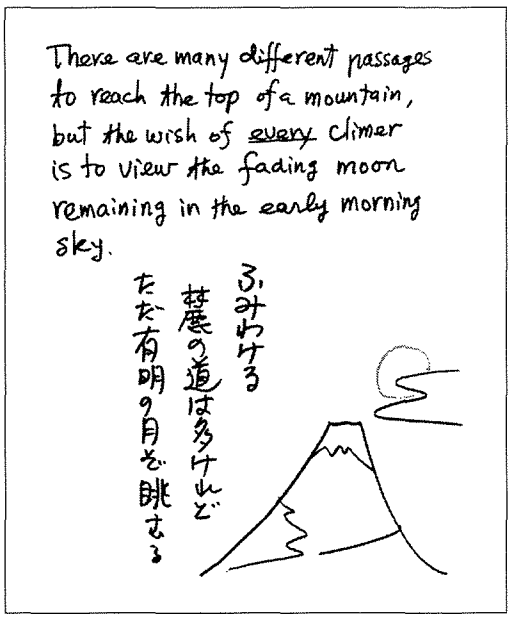


Figure 1

This cartoon represents the "global environmental research"; we call it 'the jigsaw puzzle of global environmental issues'(Figure 2). In this research area, each person has a very small piece of knowledge. A discipline adopted by each researcher is quite different from one another, but anyhow, each one of you is the expert of one small area. And we must look at how we can fit our pieces of knowledge together to benefit the global picture. Global environmental research is really a field of big science. There are many other fields which scientists deal with, such as launching of satellites; but the characteristics of this science is quite different from that one. For example, management of space technology has a top-down approach. In such kind of scientific field,

Figure 2

somebody coordinates the work of a small group of people and instructs them to make a certain kind of rocket. Global environmental research can not be done in that manner. There is no centralized administration at all, but rather a kind of network, autonomously managed by researchers in your country, in your discipline, your school and so on. In such a case, we need some device to facilitate the network.

This Open Meeting, I hope, can be s part of this big jigsaw puzzle. At first there is no map we can use to complete the puzzle. But people come and discuss whether his/her piece of the jigsaw fits next to this piece or that, and they keep on discussing in order to draw a new map with keys to solve the entire puzzle. Slowly we can determine the problems, and recognize how we can solve them. I hope we succeeded to give you some small help in this manner in the past three days. Looking down from this here, I can see satisfaction on your faces. It is probably because you have done a very good job here and were also able to meet old friends, make new friends and decide upon further research items with old and new colleagues. I think those really are the outputs of this Open Meeting.

I am especially proud of this meeting because I found good signs of continuity of this community. Last night, I was walking in the lobby on my way back from the swimming pool, and although it was almost nine or ten o'clock, I discovered a small meeting which was held by some young researchers from the meeting. I heard that last year the IHDP hosted a young researcher training workshop, and as many as seventeen of the participants at that workshop came and presented a paper here. I think that is a very good investment for this community. We have to keep our momentum, continue our movement, and we always need evolution in order to remain young forever. That is another good output.

Now let us talk about the continuity of our community. This is the third in a series of Open Meetings. What comes next? The International Scientific Planning Committee, had a meeting today in order to keep up our momentum. So many members suggested that we should plan the next meeting, and we decided to have another meeting within the next two years, probably in the year 2001. There is still no clear decision about the venue, but we hope it will be held in the Southern Hemisphere. Other things we have to think about is to re-organize the International Scientific Planning Committee. To enable this, we have established a Transition Committee with five members.

The mandate of the Transition Committee is to decide upon the time and place, and the selection of the members of new International Scientific Planning Committee. Those members include Roberto Sánchez, U.C. Santa Cruz, and Shuzo Nishioka as the two Co-Chairs of the Transition Committee. The other members are Jill Jäger of the IHDP, Marc Levy from US and Marcella Ohira Schwartz of the Inter-American Institutes. Until September 1st, the deadline for submissions, we are open to receive proposals from all members of communities. In this way we hope to ensure the continuity of this meeting.

Finally I would like to conclude my speech with many thanks, firstly to the host organization, IGES. Although half of my body belongs to IGES, I still can appreciate its great help as a host organization. IGES was very hospitable to provide us with very beautiful, cozy, isolated meeting place and accommodation. Secondly I would like to express my deep appreciation of the funding agencies: IGES, the Environment Agency of Japan, the APN, the IHDP, the National Science Foundation, IAI, the MacArthur Foundation and the National Institute for Environmental Studies. With their contribution we were able to invite many people from North and South, East and West, young and old from all over the world. Thirdly I would like to express my sincere thanks to the IGES staff who supported this meeting. Even in this information-oriented age, it is very hard work to communicate with 330 people. This time we had a very good program and compilation of the abstracts of this meeting. There are many people who worked for this meeting, I think you will get to meet them at the farewell party. Then, of course, I would like to thank my colleagues on the International Scientific Planning Committee. We had two meetings during these two years. Selecting 200 abstracts from more than 500 submissions was quite a hard work. Also, the plenary speakers and commentators: although they had only ten or thirty minutes for their presentations, each of them gave very stimulating talks, and guided us to very lively discussions. Funding, support, planning and leading speeches were all very important, but I think I owe it very much to each of you for making this meeting so successful. I hope the momentum will keep going toward next century. The next meeting will be in 2001, which is the start of the century of the environment. Let's meet again at the fourth meeting of our community somewhere on this beautiful planet. Thank you very much.

Summary report of the 1999 Open Meeting

Summary report of the 1999 Open Meeting

Jill Jäger
Co-chair, ISPC for the 1999 Open Meeting
Executive Director, IHDP

An increasing number of researchers are interested in the human causes and impacts of environmental change and conduct studies at the global, regional and local levels. To promote exchange of information on current research and teaching and to encourage networking and community building in this emerging field, the 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community was held in Shonan Village, Japan, June 24th - 26th, 1999.

This was the third Open Meeting, following the successful meetings held at Duke University, USA, in 1995 and IIASA, Austria in 1997. The 1999 Open Meeting attracted about 330 participants with almost 70 from developing countries.

Planning and Organisation

At the end of the 1997 Open Meeting a small Transition Committee was formed with the mandate to decide on the time and location of the next Open Meeting and to appoint an International Scientific Planning Committee (ISPC). During the Closing Session of the 1997 Open Meeting, the Japanese research community offered to host the next meeting. The Transition Committee accepted the invitation from Japan and appointed the ISPC[1].

The ISPC met twice before the 1999 Open Meeting. At the first meeting, held in the Cartographic Institute of Catalonia, Barcelona, the committee decided on the general structure of the Open Meeting and drew up a list of potential plenary speakers. They drafted an announcement of the meeting for wide dissemination and decided upon a timeline for activities leading up to the Open Meeting. The announcement invited members of the research community to submit abstracts of individual papers or proposals for sessions.

At its second meeting, held in December 1998 in Japan, the ISPC had the daunting task of selecting from on the order of 500 abstracts. Each member of the ISPC had read and evaluated the abstracts and session proposals that had been submitted and the secretariat had tabulated these evaluations. The large number and high quality of the abstracts provided evidence of the growing strength of the human dimensions research community. The ISPC decided that there should be a maximum of 8 parallel, small group sessions and that no more than 4 papers per sessions should be allowed, in order to provide enough time for discussions. This meant that at most 192 papers could be selected -- less than half of those submitted. The selection was made first and foremost on the basis of scientific quality, with some secondary consideration of geographical balance and a conscious attempt to include young scholars. Care was taken to select papers that reported on research, not on plans for research, networking activities or national programmes. After one and a half days hard work, the ISPC had a draft agenda of the Open Meeting -- some of the parallel sessions were selected on the basis of a session proposal, others were composed of individual abstracts that were linked thematically. The ISPC also decided to ask some people to make a poster presentation of

[1] Shuzo Nishioka (Co-chair), Jill Jäger (Co-chair), Eckart Ehlers, Lisa Graumlich, Yoshinobu Kumata, Angela Liberatore, Yanhua Liu, Elena Nikitina, Rajendra Pachauri, Ronald Rindfuss, Roberto Sánchez, Youba Sokona

their research and a slot was provided in the Open Meeting agenda for a poster session.

Soon after the December meeting, a period of intense work began for the Secretariat of the Open Meeting. The Secretariat was located at the Institute for Global Environmental Strategies (IGES), in Shonan Village Center, Japan. Hundreds of e-mails had to be sent, notifying people whether their abstract or session proposal had been accepted or not, asking people to chair sessions, determining which participants needed financial support, providing letters for visa applications, etc. The draft agenda was regularly revised, as people dropped out, added an author, changed the title of their presentation etc.

The 1999 Open Meeting

After months of preparations, the participants gathered in the Dazai Hall in Shonan Village, Japan, on Thursday June 24th, 1999 for the Opening Session of the meeting, for which Shuzo Nishioka was the Master of Ceremonies. They were welcomed by Akio Morishima, Chair of the Board of IGES, the host organization. They were also addresssed by Director-General Hamanaka of the Environment Agency of Japan, one of the main sponsors of the meeting. Jill Jäger, co-chair of the International Scientific Planning Committee thanked the sponsors, the secretariat and the speakers and commentators for their contributions to the meeting. Masuru Moriya, Secretary-General of IGES provided logistical information.

After the Opening Session, participants remained in the Dazai Hall for the first plenary talk, which was on the topic of Land Use and Land Cover Change and was given by Diana Liverman from the University of Arizona. She illustrated recent advances in this research area, in some cases with her own research results from work in Mexico. She also highlighted some of the challenges that future research will face: the challenge of "scale"; understanding the role of spatial and temporal variability in land use and land cover change; using remote sensing and geographic information systems in appropriate and efficient ways; linking to globalization studies; and implementing truly collaborative and carefully comparative research programmes.

The second plenary lecture was on a topic not previously covered in plenary sessions at the Open Meetings - Demographic Change and the Environment. Wolfgang Lutz of IIASA pointed to the need for more consistent approaches in studying the interactions between demographic change, economic development and environmental change. It is still very hard to come up with any generalizable findings about the nature of complex population - environemnt interactions.

The third plenary lecture, on Decision-making Processes, was given by Akio Morishima of the Institute for Global Environmental Strategies (IGES). He illustrated the linkages between international and national levels of decision-making using the example of the Kyoto Protocol to the UN Framework Convention on Climate Change. He emphasized the need for transparency in policy making and negotiation processes and for increased public participation, in order to support consensus building.

Michael Redclift of Kings College, London University gave the fourth plenary lecture on the topic of Conflict and the Environment and discussed how approaches to this topic have changed in the last 50 years. He suggested that by examining the various spheres of environmental conflict and risk, we can broaden the compass of debate about "environmental management", making it more reflexive, and facilitating further the "ownership" of the environmental debate.

Finally, the last plenary talk was on the topic of Valuation of Ecosystem Services. Leena Srivastava of TERI, India, looked at the strengths and shortcomings of this research area, in particular from a developing country perspective. For each of these plenary lectures there was a prepared commentary and a short time for questions and comments from the audience.

The formal Closing Session of the 1999 Open Meeting was chaired by Jill Jäger. Uno Svedin of Sweden concluded that all participants had benefited highly from this dynamic and well-planned

event. He found that there were many exciting topics and excellent opportunities for strengthening and establishing networks, assisted by the flawless organization of the meeting. Uno Svedin also noted that the 1999 Open Meeting had demonstrated the global reach of the human dimensions research community. He also concluded that there had been a consolidation of many activities in a qualitative sense since the 1997 Open Meeting. He likened the sequence of the three Open Meetings with the sweeping of the torch over the countries in the world, illuminating differences and similarities in human dimensions research agendas around the globe.

As pointers for future similar meetings, Uno Svedin's suggestions included the following:

- to "go South" (hold the meeting in the South and encourage more participation from developing countries)
- further pluralization of participants, including the involvement of "stakeholders"
- continue to close the gap between natural science, social science and humanistic research approaches
- connect to other globalization discourses

The second speech in the closing session was from Eckart Ehlers, Chair of the IHDP Scientific Committee, who felt that from now onwards, Shonan Village will stand as a milestone in the development of human dimensions research on global environmental change. In order to take up the opportunities that are lying ahead for the social sciences, in order to meet the challenges that global environmental change research offers to the social sciences and in order to come up to the expectations that people have, Eckart Ehlers urged those that have not done so until now to organize national or regional committees of human dimensions researchers. He suggested that the creation and organization of national or regional committees is an indispensable pre-condition not only for a stronger visibility of the social sciences in the field of global environmental change research but also a stimulus for closer cross-disciplinary cooperation and the discovery of mutual interests in the wide field of social sciences.

Eckart Ehlers then pointed to future scientific challenges of the human dimensions of global environmental change research community. First, he pointed to a strong necessity to focus on the generalization potential of the many valuable local or regional case studies. Second, he raised the issue of scale, because there is a tendency for the social sciences to work on local or regional bases,while the natural sciences, in the past at least, preferred the global approach. It is necessary to develop approaches that can bridge these scales. Third, it is necessary to pay more attention to globalization, which challenges human dimensions research not only due to shrinking of time and space, creating new neighborhoods in a diminishing world, but also new fragmentations.

After a plenary discussion on the content and organization of the 1999 Open Meeting, Shuzo Nishioke made the closing speech -- again thanking all of the participants, speakers and sponsors. The formal Closing Ceremony was followed by a wonderful farewell banquet with Japanese specialities and entertainment.

An innovation at the 1999 Open Meeting was the Poster Session held for an hour on the afternoon of the second day. The response to the poster session was very positive, with many participants taking the opportunity to go to the session and discuss with the authors. The success of the poster session suggests that similar sessions should be organized in future meetings of this kind.

The plenary and poster sessions were followed by smaller parallel group sessions. Usually, there were eight sessions in parallel - and it was sometimes quite difficult to decide, which of the sessions to attend. There was a large number of sessions on Land Use and Land Cover Change reflecting the maturity of this area of human dimensions research. There were also several sessions on other

IHDP topics -- Industrial Transformation, Human Security and Institutions. In addition there was a wide range of sessions on other topics such as urbanisation, attitudes and behaviour, and the linkages between science and policy. The selected abstracts were compiled into an abstract volume -- something that had not been done at previous meetings. The abstract volume provides a unique overview of the numerous areas of current human dimensions research.

The success of the meeting was certainly enhanced by the excellent conference facilities and the unwavering support provided by the host institution -- IGES. Furthermore, without financial support from the Environment Agency of Japan, the Asia Pacific Network for Global Change Research, the Inter-American Institute for Global Change Research, the US National Science Foundation, the IHDP, the John D. and Catherine T. MacArthur Foundation, the Center for Global Environmental Research of Japan and IGES, the meeting could not have taken place. At the end of the meeting the ISPC unanimously agreed that a fourth Open Meeting should be organized in about two years time -- preferably in a developing country. A small transition committee was formed to decide on the time and place of the next meeting and to appoint an International Scientific Planning Committee.

Vienna, December 1999

Appendices

Programme of the meeting

Day 1 24-Jun

9:00 **Opening Ceremony** L-Dazai-Hall

Session1

9:30 **Plenary Talk**
Land Use and Land Cover Change L-Dazai-Hall

10:45 **Parallel Sessions**

1.1	Industrial Transformation: Indicators and Corporate Practices	S-Conference Room 2
1.2	Decision-making processes: International Approaches	L-Isshiki
1.3	Resources, Security and Adaptation	L-Sengen
1.4	Climate Change and Risk Management	S-Conference Room 5
1.5	Land Use and Land Cover Change: Multiscale Approaches	S-Auditorium
1.6	Public Perceptions of Global Environmental Change: Cross-national Comparisons	L-Dazai-Hall
1.7	Sustainable Development	S-Conference Room 1
1.8	Integrated Assessment/Integrated Regional Assessment	S-Conference Room 6

12:30 **Lunch**

Session2

14:30 **Plenary Talk**
Demographic Change and the Environment L-Dazai-Hall

15:45 **Parallel Sessions**

2.1	Industrial Transformation: The Energy Sector	S-Conference Room 1
2.2	Decision-making processes: Participatory Approaches	S-Conference Room 2
2.3	Institutionalizing Science in Global Environmental Policy	S-Conference Room 5
2.4	El Niño	S-Conference Room 6
2.5	Land Use and Land Cover Change: Rapid Urbanization	L-Sengen
2.6	Land Use in Temperate East Asia	S-Auditorium
2.7	Integrated Assessment for Environmental Security in the Asian Region	L-Isshiki
2.8	Demographic Processes and the Environment	L-Dazai-Hall

18:30 **Welcome Party**

Day 2 25-Jun

Session3

9:00	**Plenary Talk**	
	Decision-making Processes and Global Environmental Change	L-Dazai-Hall
10:15	**Parallel Sessions**	
	3.1 Industrial Transformation: Trade, Transport and Transitions	S-Conference Room 1
	3.2 Institutional Interplay: The Vertical Dimension	L-Dazai-Hall
	3.3 Eco-policy linkage	S-Auditorium
	3.4 Vulnerability and Impact Assessment	S-Conference Room 2
	3.5 Land Use and Land Cover Change: Innovations in Modeling	S-Conference Room 5
	3.6 Carbon Management Post-Kyoto	S-Conference Room 6
	3.7 Attitudes and Behavior: European Perspectives	L-Isshiki
	3.8 Sustainable Urbanization in East and Southeast Asia	L-Sengen
12:00	**Lunch**	

Session4

14:00	**Poster Session**	S-Conference Lobby
	Demonstration	(Basement)
15:15	**Parallel Sessions**	
	4.1 Industrial Transformation	L-Dazai-Hall
	4.2 Environmental Conflict Management	S-Conference Room 5
	4.3 Decision-making Processes	S-Conference Room 2
	4.4 Urbanization	S-Conference Room 1
	4.5 New Data Acquisition and Integration Methods for LUCC Studies	S-Conference Room 6
	4.6 Land Use and Land Cover Change: Subsistence Agroecosystems	L-Sengen
	4.7 Attitudes and Behaviour: Climate Change	S-Auditorium
	4.8 Innovative Social Sciences in the Coast Zone	L-Isshiki
19:30	**Evening Meetings on Programs and Networks**	

Day 3 26-Jun

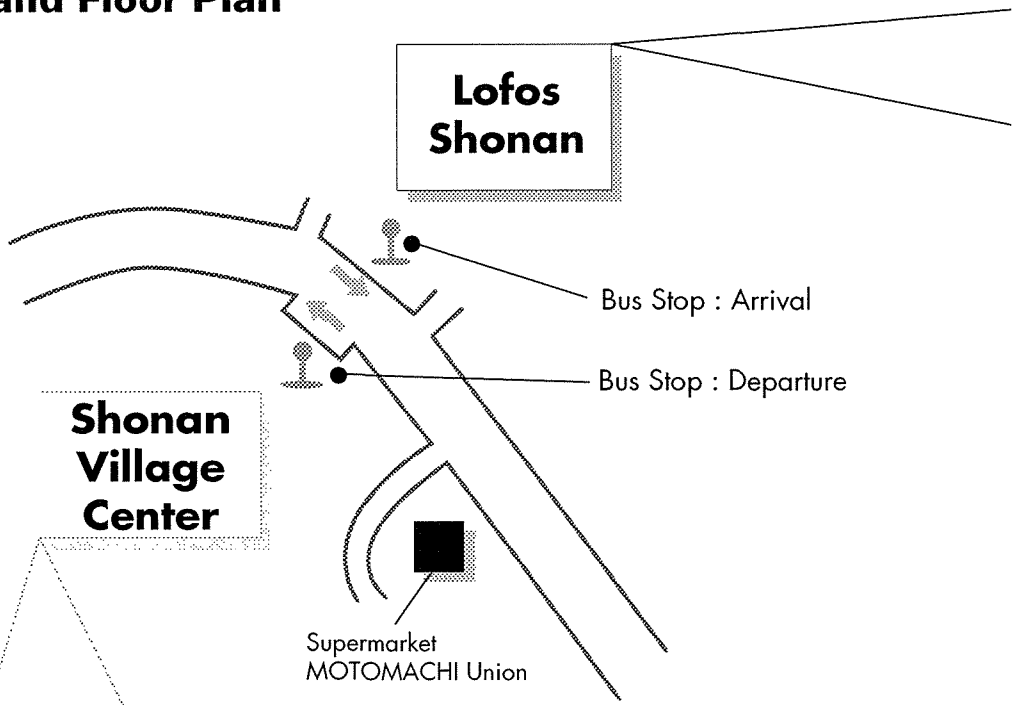
Session5

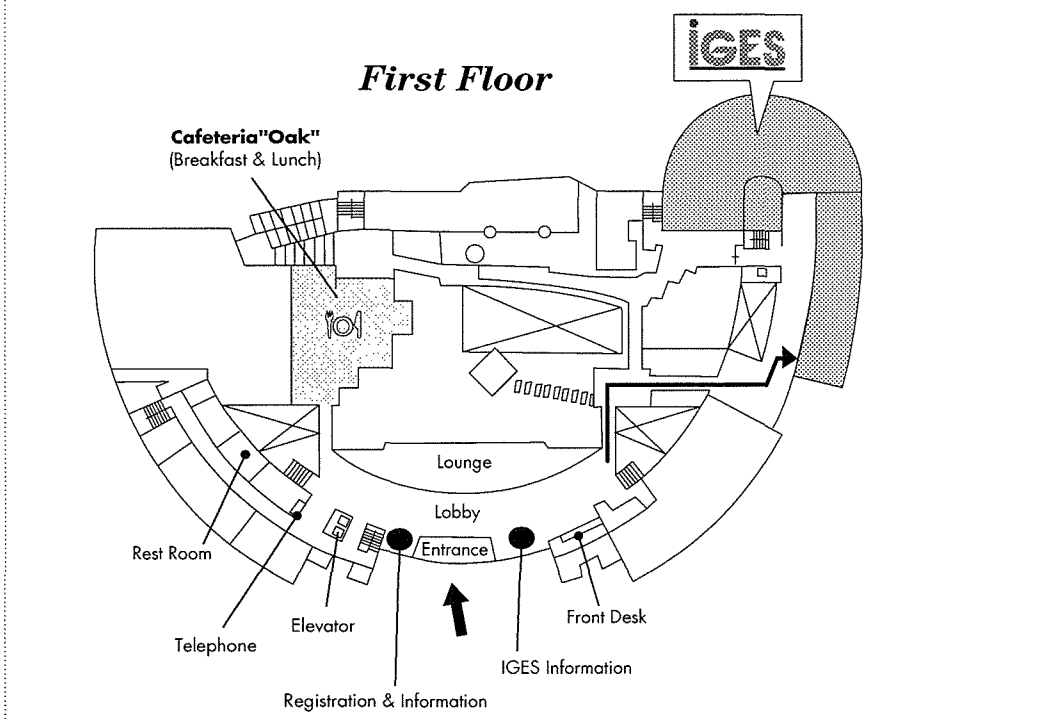
9:00	**Plenary Talk**	
	Conflict and the Environment	L-Dazai-Hall
10:15	**Parallel Sessions**	
	5.1 Study of the Environmental Management and Audit	S-Conference Room 6
	5.2 Conflict and the Environment: Conflict Resolution	S-Auditorium
	5.3 Global Change Science and Decision-making	L-Isshiki
	5.4 Business and Trade	S-Conference Room 1
	5.5 Health	S-Conference Room 2
	5.6 Qualitative Approaches to Integrated Assessments of Land Use and Land Cover Change	L-Dazai-Hall
	5.7 Land Use and Land Cover Change: Case Studies	L-Sengen
	5.8 Attitudes and behaviour: Citizens	S-Conference Room 5
12:00	**Lunch**	

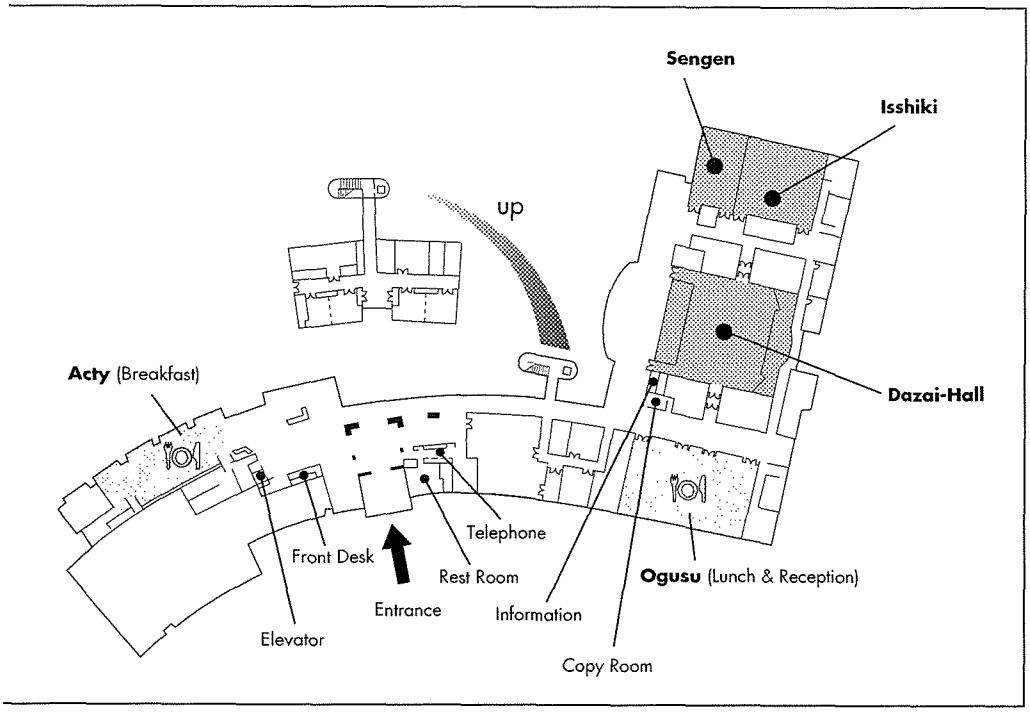
Session6

14:00	**Plenary Talk**	
	Valuation of Ecosystem Services	L-Dazai-Hall
15:15	**Parallel Sessions**	
	6.1 Human-Environment Interactions	S-Conference Room 6
	6.2 Resources, Security and Adaptation II	S-Auditorium
	6.3 Towards the critical evaluation of global environmental assessments	L-Isshiki
	6.4 Population and Land Use in China, India and the United States: Results of the Tri-Academy Project	L-Sengen
	6.5 Land Use and Land cover Change: Climate Feedbacks	S-Conference Room 1
	6.6 Valuation of ecosystem services	S-Conference Room 2
	6.7 Regional Environmental Risks and Risk Perception in Asia	S-Conference Room 5
17:30	**Closing Session**	L-Dazai-Hall
19:00	**Farewell Party**	

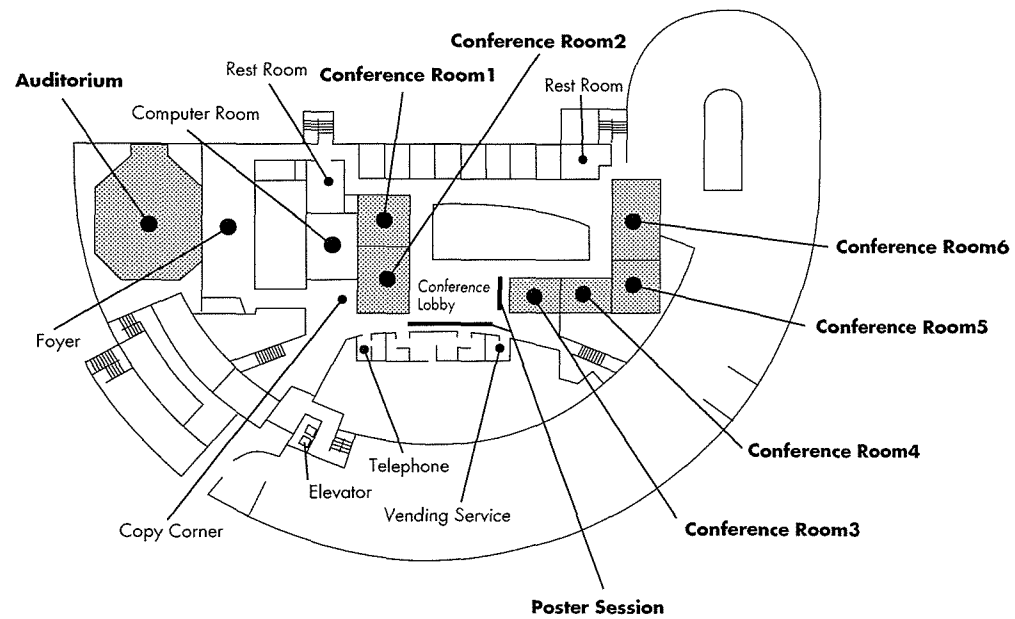
Map and Floor Plan







Conference Floor



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1999 OPEN MEETING OF THE HUMAN DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE RESEARCH COMMUNITY

REPORT

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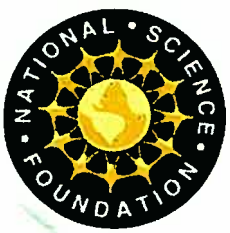

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