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**UNITED NATIONS ENVIRONMENT PROGRAMME
(UNEP)**

**CONSULTATIVE MEETING ON ENVIRONMENT AND
ECONOMICS**

SUMMARY RECORD

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Nairobi, 26-28 February 1992

SUMMARY RECORD

**Hussein Abaza
Meeting Organizer and Rapporteur**

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INTRODUCTION

1. The Consultative Meeting on Environment and Economics was sponsored by UNEP in order to solicit expert advice on how the discipline of economics can assist UNEP better fulfil its catalytic, coordinating, consensus-building and capacity-building functions.
2. The Meeting was convened at UNEP headquarters in Nairobi from 26-28 February 1992. It was attended by 26 representatives from governmental, non-governmental and international organizations, universities and academic institutions and five individual experts. The list of the participants is attached as Annex I.

1. Opening Remarks

3. The Meeting was opened by Mr. Evteev, Assistant Executive Director of UNEP, Office of the Environment Programme, who welcomed the participants to the meeting on behalf of the Executive Director. He stated that the area of environment and economics was of great importance to UNEP's work. He explained that UNEP anticipated that the meeting would make recommendations on its future work in that area and provide the basis for an Action Plan for UNEP on Environment and Economics.
4. Mr. Evteev pointed out that the question of environment and development linkages had been discussed even before the Stockholm Conference on the Human Environment in 1972. In its activities, UNEP viewed that question as one of high priority that was becoming increasingly important. Following the preparatory process of the United Nations Conference on Environment and Development (UNCED), it had become increasingly apparent that such cross-sectoral issues were much more difficult to discuss than sectoral issues, such as oceans, desertification, soil, tropical forests, etc. The discussion in the next three days would help not only UNEP, but also the world community, to come to some agreement on what was the real relation between environment and development and how the world community, including organizations such as UNEP, should tackle those issues. Finally, Mr. Evteev proposed that Mr. Grubb, Royal Institute of International Affairs, take the role of coordinator of the meeting.
5. Mr. Abaza, Assistant Policy Adviser to the Executive Director of UNEP informed participants that the meeting was being held directly after the Committee of International Development Institutions on the Environment (CIDIE) Workshop on Environmental and Natural Resource Accounting, hosted by UNEP. He noted that some of the participants at that workshop were also at the present meeting. He indicated that UNEP had worked on the subject

of environmental and natural resource accounting since the early 1980s. That work had culminated in a joint UNEP/World Bank Expert Meeting on Environmental Accounting and the SNA in Paris in November, 1988. Apart from that, UNEP had not clearly defined its involvement in the environmental implications of economic development and the use of economic instruments and tools for environmental management.

6. He highlighted five major concerns to UNEP in the area of environment and economics. The first was the financial implications of implementing international agreements on the environment. Those implications had been one of the major bottlenecks in negotiating such conventions. They involved the financial implications of undertaking conservation measures and the economic rationale behind the contribution of developed and developing countries to international environmental agreements, including mechanisms involving the transfer of technology and resources. He stated that the second concern was the additional financial resources required for funding international environmental agreements and programmes. He asked whether the existing financial resources needed to be restructured or rechannelled. The third concern was valuation. He indicated that the main conclusion of the recent CIDIE Workshop on Environmental Economics hosted by the World Bank was the need for some sort of guidelines on the use of various techniques for valuing environmental goods and services. It was not clear at present which methodologies should be used for valuing the various components of the environment. He indicated that another concern was the use of various economic instruments, such as taxes, subsidies and charges for environmental management. The Organisation for Economic Cooperation and Development (OECD), for instance, had published a guidelines document on the adoption of such instruments in OECD countries. To what extent could developing countries also apply those instruments? The last concern was the impact of international economic relations on environmental planning and management. Those included the relief and structuring of external debt of developing countries, structural adjustment programmes, commodity terms of trade, non-tariff trade barriers and conditionality of aid. He concluded his opening remarks by pointing out that UNEP hoped that the meeting could provide a broad framework on how, and to what extent UNEP should get involved in the area of environment and economics, keeping in mind its expertise and limited financial resources.

7. Mr. Osman, Assistant Executive Director of UNEP, Office of Policy Development and Inter-Agency Affairs, added that UNEP, at this stage, wanted to review the extent to which the current state of economic knowledge was adequate for incorporating environmental considerations.

It needed to know how economics could explain a number of conceptual issues in the analysis of some specific environmental problems. For example, regarding conventions, UNEP wanted to give an economic basis for the assignment of responsibilities to developed and developing countries.

2. *General Discussion*

8. Mr. Grubb assumed the function of coordinator of the meeting. As a preliminary comment, he stated that the meeting was dealing with two different axes of issues. The first consisted of a list of the economic issues to be addressed. That included the use of environmental and natural resource accounting, which should not be a subject of the meeting since it had been discussed in the CIDIE Workshop, which had preceded the meeting. Other issues in the first axis included valuation and cost-benefit analysis (CBA), additional financial resources, and the separate issues of international and domestic economic mechanisms for environmental management. Domestic mechanisms, which were the domain of national governments, were mostly either well understood or already under discussion. International mechanisms referred, on the other hand, to possibly innovative means of international agreements, perhaps involving the use of international market instruments leading to international financial flows.
9. He indicated that a list of associated institutional issues formed the second axis. In that respect, he stated that perhaps the design of institutional mechanisms should not be discussed, since it was as much about the technical aspects of monitoring and enforcement provisions as it was about straightforward economic issues. The design of mechanisms also tended to be very specific to the environmental problem involved. He was also unsure of how much the meeting wanted to go into the specific institutional issues pertaining to individual subjects, such as biodiversity or climate change, since he understood the meeting to be more concerned with the underlying themes and common issues of economics that surfaced in all the subject areas. He added that equitable distribution of costs was, however, a central issue and could possibly be a topic in its own right. He stated that there were typically two strongly opposed views on the subject of international economic relations and the environment. The first was that the international community could not conceivably start talking seriously about global sustainable development without addressing the whole question of inequitable international distributions, debt and trade regimes. The other view was that if the international community started to address the whole question of the international economic order, then it would not get far in solving international environmental problems. According to that view, the

international community therefore needed to select aspects of the international economic order that were feasible and specific to environmental issues.

10. He proposed, therefore, that the set of institutional issues of concern to the meeting should be the feasibility and appropriateness of UNEP getting involved in those issues. In other words, could UNEP actually do useful economic work on those issues? Was that kind of work being done elsewhere? If UNEP were to get involved in that work, what would be the relationship between UNEP's efforts and the work of other institutions in the field? He suggested that the meeting follow that axis of economic and institutional issues and sought reactions from other participants on those topics on which they felt the meeting should concentrate.
11. In response to a question from numerous participants on whether or not the meeting should focus on national or international issues, Mr. Osman replied that UNEP wanted to have the analytical tools applying to both the domestic and international dimensions of environmental problems. The meeting should therefore contribute to efforts in environmental management at both levels.
12. Discussion then ensued on the most appropriate way to structure the meeting. Mr. Trindade, SE²T International Ltd., suggested that, due to the limited duration of the meeting, it should be structured based on a recognition of the ongoing programmes of UNEP and, in particular, the ongoing negotiations of conventions. That would help to make the meeting more practically oriented. He indicated that the basic issue in the discussion of conventions was the transfer of resources and the meeting could primarily focus on that topic. He added that the topic of resource transfers raised a whole host of issues, including valuation, additionality of resources, costing methodologies, timing, discount factors, etc.
13. Mr. Friend, Institute for Research on Environment and Economy (IREE), stated that the meeting should expand the discussion to include the question of analytical frameworks. It should, in particular, make a distinction within the science of economics between the neoclassical framework and the new framework of ecological economics. The latter framework was slightly out of the mainstream and related to the thermodynamic point of view developed by Georgescu-Roegen and others. He stated that many questions pertaining to environment and development could be analysed more appropriately within that new framework. He added that UNEP had a particular set of values which could be different from those of other

international organizations and agencies. In particular, UNEP had values that were longer-term in nature. For example, many donor agencies used frameworks that did not take into account the longer-term benefits of conserving resources such as biodiversity. The meeting should therefore advise UNEP on the appropriate analytical framework, in the context of values, within which it should conduct its economic analysis of environmental problems.

14. Mrs. Parikh, Indira Gandhi Institute of Development Research, also stressed the need to talk about an overall framework for dealing with methodological and conceptual issues, as opposed to discussing individual topics or environmental issues.
15. Mr. King, University of Maryland, added that the neoclassical framework involved working within four constraints. The first was the omission of equity considerations. The second consisted of scale issues; the neoclassical model assumed that technical innovation, feedback mechanisms and input substitution would get the economy around some of the geophysical limits. The third and most important constraint was the assumption of consumer sovereignty. Environmental economics assumed that environmental problems were isolated cases of market failure. In other words, people had preferences but the problem was one of market imperfection or failure. The fourth constraint concerned institutional arrangements. Most traditional economic analysis of environmental issues was designed around maintaining the existing set of institutions. He concluded that the meeting needed to decide whether to discuss issues within or outside those constraints.
16. Mr. Mäler, Beijer Institute for Ecological Economics, stated that it was not appropriate for the meeting to go into a discussion of whether the neoclassical or the ecological economics framework was appropriate. The world faced problems and economists should help solve those problems using the tools available, regardless of the discipline from which those tools had emerged.
17. Mr. Grubb expressed concern about the issue of resource transfers. He stated that resource transfers were a highly political equity issue involving ethical judgments, and not an economic issue. Economics could contribute to the question of what costs and impacts different countries would incur if they were to undertake abatement or adaptive action.
18. Mr. Mäler responded to Mr. Grubb's comment on resource transfers by stating that those transfers were not only an ethical issue. By applying

game theory to international environmental problems, one immediately saw that side payments were needed for the resolution of those problems. The side payments were nothing but resource transfers. Economists not stressing enough the necessity of those side payments had reduced the applicability of economic analysis to international environmental problems. Without side payments, economists were precluding many outcomes, which would improve human welfare not just in a single country, but all over the globe.

19. A number of other participants also commented on the issues of resource transfers, side payments and equity considerations. Mr. Andersson, Stockholm School of Economics, argued that the meeting should not discuss equity when discussing how to use economics meaningfully in dealing with environmental problems. Economics should examine how to use resources in a most effective manner. That made it possible to consider transfer payments because they emerged as an interaction between countries sharing common resources. Those transfer payments could take many different forms. For example, many developing countries were currently experiencing a scarcity of capital, accompanied by a huge debt burden. That scarcity of capital resulted in an extremely high discount rate. Thus, such countries could not undertake investments to protect their natural resources. From a global perspective, given the scarcity of capital, resource transfer implied an increased ability of countries to undertake investments to solve environmental problems. Those transfers could perhaps involve debt forgiveness, as opposed to providing additional financial resources.
20. Mr. Andersson also indicated that, though economists would expect more such payments to take place in view of the environmental problems that they could help to solve, such payments were few. One reason for the lack of transfer payments could be the failure of governments to maximize social welfare from a temporal perspective. That could be due to a lack of perfect information, as environmental issues involved a great deal of uncertainty with many effects arising only in the long-term. Economists should therefore identify the consequences, over time, of using resources in order to determine how to use such resources in the most effective way.
21. Mr. Heller, Stanford University, stated that he was in favour of transfer payments and side payments. Although they could be efficient, part of the reason why more transfer payments were not observed was that people saw them as moral questions. For example, some people could perceive transfer payments as providing an incentive to induce more transfer

payments. Thus, transfer payments were never really separated from moral perceptions and the perceptions of long-run behaviour. Those perceptions were important and affected the ability to reach and maintain negotiated solutions to environmental problems.

22. Mr. Winpenny, Overseas Development Institute (ODI), stated that the meeting should not focus exclusively on resource transfers. Transfers, whether financial, technical or of other kinds, were instruments which emerged from an analysis of national and international issues. He emphasized that such transfers were merely one of the policy issues which emerged. It was also important for the meeting to consider national environmental issues, whether or not they involved international resource transfers. He added that transfers were not just an ethical issue. Discussing the form and size of transfers yielded important economic insights as well.
23. Mr. Potier, Organisation for Economic Cooperation and Development (OECD) indicated that, just as the Governing Council of UNEP was putting pressure on it to address the issue of environment and economics, the OECD was putting more pressure on its negotiator to pay more attention to economics in the negotiation of a framework convention on climate change. Most of the negotiators of that convention and other environmental agreements were diplomats. Those negotiators could consider imposing the same rate of emission reduction on every country as an equitable solution, but it would not be effective. There was thus a need to inject more economics into the negotiations. He stated that the OECD had held an informal workshop two weeks before, for negotiators from OECD countries for the framework convention on climate change on the concept of cost effectiveness referred to by Mr. Mäler and Mr. Andersson. Although some OECD countries were reluctant to promote side payments for ethical reasons, from an economic viewpoint, they were necessary for reasons of effectiveness.
24. Mr. Schuler, Cornell University, pointed out that environmental economics clearly involved equity implications. Those implications could not be separated from the analysis. He also proposed that the field of new institutional economics could be of relevance in the analysis and resolution of environmental problems. For instance, to what extent were there frictions in the operation of institutions which were inhibiting the resolution of those issues? In other words, how free was the trade in environmental goods and services?

25. Mr. King asked if it was necessary to link side payments with equity considerations. Did economists need to view side payments as an equity redistribution of income as opposed to a payment to a country for protecting resources that benefited all countries? With respect to equity, he pointed out that nonmarket valuation techniques, although an important tool for dealing with environmental issues, were irrelevant if they did not incorporate the effect of income on people's preferences and how they responded to those issues.
26. Mr. Friend stated that the issues paper prepared by UNEP for the meeting went clearly beyond just the issue of transfers. The paper raised a number of other issues as well. For instance, how could economics deal with the concept of sustainable development and the question of the whole development process itself? There was enormous concern about resource depletion in the world today but the current economic framework did not adequately incorporate those concerns.
27. Mr. Grubb pointed out that there were very important distributional issues which were fundamentally economic in nature and others which were also concerned with what was fair. It was difficult to disentangle those different issues, which both involved distribution.
28. He suggested that the meeting move on to other issues on the list he had presented. He pointed out that the real problems in assigning actual costs in many environmental issues was the tendency in CBA to neglect those elements which the economist was unable to quantify but which could be very important. He asked if the meeting should attempt to reach some conclusions about the value, or lack of value, of CBA for addressing some environmental issues.
29. Mr. Potier reported that, regarding CBA, the OECD was now working on the development of a new manual on project and programme appraisal incorporating environmental issues and including the issues of uncertainty and irreversibility. He stated that a draft manual should be available within the next ten months.
30. Mr. Nickum, East-West Center, pointed out that CBA was a tool for assessing investment decisions, originally developed for the project level. It was, however, limited and would not solve the problem. Perhaps placing the techniques used in CBA under the title valuation was a better way of dealing with that whole set of tools. He added that there was much scope for using the valuation techniques that came out of CBA.

31. Mr. Trindade stated that in CBA one could prove almost whatever one wanted. That arose because getting universal agreement on values, such as in the determination of shadow prices, was difficult. CBA was thus an instrument of limited value.
32. Mr. Mäler stated that valuation was essential and that the meeting should therefore discuss valuation and its role. Assessing the importance of resources and the environmental functions provided by ecosystems was necessary and developing the techniques of valuation was one way to do that. Valuation exercises were an attempt to find the impact of pressures on natural resource systems on human welfare, and those receiving those services - the question of equity in that context was an important issue.
33. Mr. King stated that, with respect to valuation, although economists and ecologists could possibly discover the functions provided by environmental systems, they would probably not always be able to come up with a justification for saving those systems based on valuation alone. He cited the particular case of wetlands. The benefits provided by those systems were so many in number and so diffuse that CBA would not be able to help very much in conservation arguments.
34. Mr. Grubb agreed with Mr. King's comment on the limits of valuation of CBA. Economists usually argued, however, that any use or nonuse of resources implied some valuation of those resources. They should therefore attempt to determine the value people placed on those resources.
35. Mr. Grubb suggested that the discussion of CBA and valuation implied that there were two topics on the list - valuation and decision-making under uncertainty - where before there had been only one. He then proposed that the meeting move on to the questions of mechanisms, both domestic and international, such as taxes and other market mechanisms.
36. Mr. Mäler and Mr. Nickum asked whether the meeting should consider those mechanisms as new sources of funding (as stated in the issues paper) or as enhancing efficiency.
37. Mr. Grubb responded that the meeting should look at the efficiency aspect of those mechanisms first and then the transfer aspect.
38. Mr. Trindade stated that most developing countries did not have the capacity to use the existing funds adequately. Environmental problems needed to be addressed with a menu of resources. He added that, if the

meeting did not take a broader perspective on the issue of mechanisms, then it would not add much to the discussion.

39. Mr. Potier pointed out that very often market-based instruments were seen as a way of raising funds. But those instruments did not currently fulfil the incentive function because governments set them at too low a level. The instruments did, however, fulfil an important role with respect to the redistribution of funds. Such instruments were thus contributing to the setting up of environmental programmes in some governments.
40. Mr. Grubb invited comments from participants on the last topic in the issues paper concerning the existing structure of international relations and the environment, especially the area of trade and the environment.
41. Mr. Osman indicated that UNEP was addressing two issues in that area. The first was the implications of some of the international environmental agreements, which could restrict the movement of certain goods and services and the flow of free trade. The second issue was that some environmental concerns could be used by some countries to impose their own standards on the flows of trade. UNEP felt that that area posed a real danger of conflict and was trying to see how this could best be resolved. He cited the recent example of the United States of America (USA) refusing to accept tuna imports from Mexico on the grounds that dolphins were endangered in the process of catching the tuna. He added that UNCTAD was also treating the issue as a major item with respect to international trade and the environment.
42. Mr. King pointed out that the issue in the case of the tuna dispute between Mexico and the USA was not one of population dynamics and maintaining a sustainable yield. Almost all of the disagreement involved strictly values and, perhaps, associated risks. The ethical concern of the US public was simply that it did not want dolphins to be killed.
43. Mr. Trindade referred to the recent General Agreement on Tariffs and Trade (GATT) report on trade and the environment. He stated that the report contained some encouragingly fresh perspectives, including some implications relating to the transfer of resources. The report concluded that environmental concerns should not place any particular burden on international trade. In fact, perhaps the new valuation of resources brought about by global conventions would provide new opportunities for growth and development.

44. Mr. Potier pointed out that the GATT report was a source of concern for many in the environmental community. The concern arose from the conclusion of the report that the roots of environmental problems could be found primarily in the mismanagement of the environment. The report thus argued that trade shared only a small responsibility for environmental problems. Those problems resulted from externalities in individual countries that governments did not correct. He emphasized that the role of trade in causing environmental problems depended, however, on the sector under consideration. For example, in the transport sector, trade could be playing a large role. The report also concluded that, in no particular circumstance, should governments use trade to achieve environmental objectives. He stated that that conclusion could be stretching the argument too far. The OECD was conducting similar discussions, where it brought together experts from both the trade side and the environment side, while the GATT discussions involved only trade experts. More nuanced views therefore came out of the OECD discussions. For example, there could still be cases where governments would need to influence trade to achieve specific long-term objectives. He added that the OECD was also involved in discussions on the harmonization of environmental standards. He pointed out that trade and environment was an important issue, which was required to be addressed by the world community. He stated that the OECD was willing to cooperate with UNEP in that area.
45. Several participants raised other issues relating to trade and the environment which they felt the meeting should address. Mr. Magadza, Zimbabwe, stated that a dominant aspect of international trade was the extraction of raw materials in developing countries and their export to developed countries. But with a decrease in the price of those raw materials, countries had to extract more of the resources to maintain the same income in foreign exchange, resulting in more environmental damage.
46. Mr. Friend raised another aspect of trade which had been discussed during the CIDIE Workshop in Environmental and Natural Resource Accounting. That was the environmental externalities arising from industrialized countries' imports from developing countries. For example, Japan had estimated the externalities based on its imports of tropical hardwood, ivory and one or two other items.
47. Mr. Nickum added that the meeting should also address investment flows. More classically, the environmental impact of trade had been in terms of investment flows - the export of polluting or extracting industries.

48. Mr. Ndegwa, First Chartered Securities Ltd., argued that the meeting should not restrict itself within a theoretical framework. He pointed out that the use of economic arguments for environmental protection was not fully understood by donors and funding agencies. There was, therefore, a need to discuss the broader issues in order to get a common framework to assist UNEP advance its programmes. He added that valuation was related to many factors such as the distribution of income, technology and the availability of resources. Economists had to acknowledge that, before putting forward highly theoretical arguments.
49. Mr. Rubenstein, Princeton University, stated that developing and developed countries had different perspectives on environmental problems which they were jointly creating. Each side had different feelings about how important various issues were and what the ramifications were for their own economies. He suggested that the meeting should pick some of the critical environmental problems and then deal with the economics of trying to solve them, as opposed to discussing approaches. Using that strategy, the meeting could try to develop a general understanding of the analytical process which could guide UNEP in trying to solve particular problems. The meeting thus agreed that it would next discuss three subject areas, biodiversity, climate change and desertification, to determine what were the relevant economic issues involved in each topic. The meeting decided to invite UNEP programme officers from those three areas to make a short presentation to participants in the meeting.

3. Economic Implications in the Implementation of Selected UNEP Programme Areas

3.1 Biological Diversity

50. Mr. Zedan, senior Programme Officer for Biological Diversity, Microbial Resources and Related Biotechnologies, UNEP, gave a short presentation on UNEP's role in the ongoing negotiations for a convention on biological diversity. He first stressed that it would be difficult for the negotiations to advance unless economists and biologists began talking a common language. He explained that the Governing Council (GC) of UNEP had recognized the need for concerted international action on biodiversity and had recommended the preparation and adoption of a global legal instrument for the conservation and sustainable use of biodiversity. The GC therefore established two working groups. The first was a group of technical experts to consider the technical aspects of a convention. The second group was

established to negotiate the convention. It was subsequently renamed the Intergovernmental Negotiating Committee (INC) for a Convention on Biodiversity. The INC had made good progress on the Convention, which should hopefully be ready for signing at UNCED.

51. He indicated that, in the negotiations, developing countries claimed that they needed new and additional financial resources for the conservation of biodiversity. On the other hand, the developed countries argued that they were already giving a lot of financial resources to developing countries for the conservation of biodiversity. The INC had therefore requested the UNEP Secretariat to prepare two in-depth reports on the global cost of conserving eight priority areas identified by the technical working group and on the amount of financial resources currently available for developing countries for the conservation of biodiversity from both multilateral and bilateral sources. The first report estimated that the global cost of conservation would amount to between US\$1 billion and US\$10 billion per year over a period of 10 to 15 years, while the second report estimated the amount of current financial resources available to be US\$230 million per year.
52. He stated that the INC had therefore recommended the preparation of country-specific case studies to refine the order of magnitude of the cost of conserving biodiversity and also to incorporate the benefits of such conservation. In those studies, countries were asked to undertake a quick survey of their biodiversity and to identify specific sites and species whose conservation would imply conserving a large portion of the countries' biodiversity. UNEP provided the countries with guidelines for that task. The countries were also requested to propose measures for effectively conserving those sites and species and to estimate the costs of those measures. In addition, the countries were to estimate how much money for conserving biodiversity was currently available from domestic and outside (both bilateral and multilateral) sources. They were then asked to estimate how much they were currently benefiting from those sites and species and how much they expected to benefit in the future.
53. He indicated that almost 30 studies would be prepared in total, of which 10 had been received so far. In those 10 studies the biological data gathered was reasonable. There were, however, a lot of gaps in the economic information because countries faced difficulties in valuing many nonmarketed natural resources. Biodiversity provided many services in addition to goods. For instance, how should countries place a monetary value on the stabilization of the climate or the provision of clean air? Another problem was that countries had attempted to provide gross as

opposed to net benefits, because they did not know how to value the other biological costs associated with the use of natural resources. Not valuing those costs encouraged countries to overexploit their natural resources. Standardized methodologies for valuation of the costs and benefits of conserving biodiversity were therefore needed in order to compare results between countries. As a result, countries would hopefully be able to develop national action plans and strategies on biodiversity and reflect the value of biodiversity in their national accounts. But the problem was how to go about that valuation. He emphasized that governments needed to know the total cost of implementing any agreement before they would agree to provide financial support. Thus, the information was needed even if it was crude. In addition, even if developed countries could provide the necessary financial resources, developing countries often did not have the infrastructure to absorb those resources.

54. Mr. Magadza pointed out that another issue, in addition to developing countries' ability to absorb additional financial resources, was their competence in participating and entering meaningfully into international discussions of that type, with knowledge of the implications involved. In recent years, international environmental issues such as the ozone layer and climate change had come as an avalanche. Some developing countries therefore needed time to digest those issues and to determine how they could meaningfully contribute to the discussions of problems which had not yet been addressed at the domestic level.
55. Mr. Winpenny asked what the basis for estimates of the global cost of conserving biodiversity in the in-depth report prepared by the UNEP Secretariat was. Was it the narrow one in the technical sense of the cost of establishing and maintaining conservation areas? Or was it a wider one, including for example the compensation of local populations and possibly the forfeit of revenue from logging nature reserves?
56. Mr. Zedan replied that the concept used was the broader one. He added that there were many reports on the global cost of conservation. Most of the estimates provided in those reports were based on the best available advice, but it was not clear what that meant.
57. Mr. Dabholkar, Chief of the Development Planning and Cooperation Unit and Deputy Coordinator, Support Measures, UNEP, stated that, regarding the scope of valuation, UNEP was concerned with how to evaluate the foregone economic benefit of a resource to be conserved under a global agreement. UNEP did not feel confident that it had a solid enough economic

foundation when giving valuation figures to bring about an agreement between countries and to assign responsibilities for meeting the costs involved.

58. Mr. Zedan agreed and indicated that UNEP was looking for only a refined order of magnitude of the costs involved, taking into consideration opportunity costs.
59. Mr. Potier pointed out that, once the order of magnitude of costs had been determined, the next step was to examine the cost-effectiveness of different alternatives to meet those costs. He stressed the need to highlight the interrelations between those different issues.
60. Mr. Zedan agreed, but explained that biodiversity was more complicated in that regard than an area such as ozone depletion, where there were well-defined targets. For the conservation of biodiversity, a wide range of activities could be undertaken and the lack of baseline data made estimation of the incremental costs very difficult.
61. In response to Mr. King's question concerning the categories of benefits estimated in the studies, Mr. Zedan stated that those benefits differed from developed to developing countries. The developing countries concentrated mainly on marketed natural resources. Very few looked at opportunity costs. He also mentioned other problems in calculating the costs and benefits of conservation. For instance, some countries wanted to include in the cost of establishing a national park the entire cost of building a road which would service the park, but which would also serve other purposes. Developing countries also raised the issue of how to calculate benefits derived from conservation which accrued partly to them and partly to other countries, for example, from ecotourism.
62. Mr. Rubenstein stated that, from an economic point of view, the issue for each country was to decide what to do with each potential conservation area. Apart from setup costs, that also involved the issue of opportunity costs. Formulating a hierarchy of criteria for determining which land areas would be conserved was thus problematic. That hierarchy involved making an internal valuation of biological quality independent of economic and other factors.
63. Mr. Heller stressed the need to address the institutional structure for dealing with environmental problems. He stated that participants at the meeting seemed to think that the amount of resources devoted to the

conservation of biodiversity at the margin was too little. The question was what should be done about that. He asked if UNEP should be supporting what was missing in the system. That amounted to examining a set of institutions different from those currently existing. The meeting should look at the approaches which international organizations could take. One was continuing with the comprehensive planning process. The other was to change the institutions.

64. Mr. Grubb responded that the meeting should confine itself to the existing set of institutions. There had been many meetings on institutions and environmental issues but there were processes already in action with economic problems blocking their continuation.
65. Mr. Swingland, Durrell Institute of Conservation and Ecology at the University of Kent, also representing British Petroleum, raised the issue of how to address the vested interests of local peoples in the management of protected areas for conservation. The question was what value should be placed, on their behalf, on resources in whose management and conservation the international community wanted them to be involved. A complicating factor was that some governments did not want to enhance local peoples' involvement in conservation programmes.
66. Mr. Rubenstein added that governments not wanting to channel funds from international transactions of resource and conservation rights to local peoples for political reasons was clearly a problem.
67. Mr. Abaza then summarized the main problems for UNEP concerning valuation in the area of biodiversity. There was a need for standardized techniques for calculating the actual costs and benefits in exploiting as well as conserving biodiversity resources. That valuation was essential in the negotiation of the biodiversity convention and the establishment of financial mechanisms required for conserving biodiversity within the framework of the Convention.
68. Mr. Grubb added that one of the main problems was the definition of baselines for determining incremental costs. In addition, the country studies had limited their focus primarily to marketed benefits and had not considered intangible benefits or irreversible losses.
69. Mr. Magadza provided an example for the meeting to consider. Zimbabwe intended to develop a coalfield in a biodiversity conservation area. The coalfield would provide thousands of jobs and would provide support to

the steel industry. Zimbabwe could possibly trade the right to develop that coalfield, but for what equivalent value? And if the area were to be conserved, what could the Government offer people who would have received jobs in the coalfield?

70. Mr. Grubb responded that it was up to Zimbabwe to ask how much other countries should pay for the conservation of the area. For example, Zimbabwe could ask for sufficient resources to build a solar power plant that would not involve any net additional costs to the economy. The problem was thus very simple. If the primary concern about climate change came from industrialized countries, then Zimbabwe could make a choice about the level of compensation it would accept in order not to take that action. He added though, that a coalfield was a basic aspect of development which entailed global externalities, but countries would not necessarily care much about those externalities.
71. Mr. Winpenny stated that Mr. Grubb's argument had expanded the "victim pays" principle. Most victims of developing the coalfield would be local, and because many of the costs fell locally, many of the benefits of not developing the field also fell locally.
72. Mr. Grubb responded that his reasoning did not necessarily involve the "victim pays" principle. If the problem were formalized in terms of tradeable permits, then who paid and the optimal solution were two separate issues. An allocation of rights could be implemented which did not reflect the "victim pays" principle. But the tradeoff at the margin was still the same, regardless of the initial allocation of rights.
73. Mr. Winpenny cited an example from Tasmania where the question was whether to construct a hydroelectric dam across a particularly attractive river valley. The economists evaluating the project had attempted to put costs and benefits on each of the options. They then had looked at alternative options for generating the power with a geothermal plant which entailed a greater cost. They had thus calculated the net cost of preserving the valley as simply the net difference in costs between the two schemes which had turned out to be quite small. That resulted in taking the decision of not to build the dam. The example was not necessarily directly applicable to the Zimbabwe question, since coal was obviously more site-specific.
74. He added that with population growth and the spread of development, the benefits of wilderness and environmental amenities would increase in any country. Natural beauty would get scarcer, whereas the technology of

producing power would decrease as alternatives were developed over time. The long-term perspective was thus slightly tilted in favour of preservation versus development.

75. Mr. Mäler gave a presentation of a research agenda on the ecology and economics of biodiversity loss formulated by Mr. Charles Perrings, Mr. Carl Folke and himself, as part of the research programme on the economics of biodiversity loss, undertaken at Beijer International Institute for Ecological Economics. He identified four important areas of research. The first was ecological research into the functions of the ecosystems that contain the endangered species. The focus should not be on the species themselves, but on the aggregation of species in the form of ecosystems. The interesting question was what kind of functions did those ecosystems provide to humans.
76. He stated that the second research topic was the area of valuation of those various functions provided to humanity. That implied valuing the services provided to the local community, the region and humanity in general, such as the control of hydrology and the microclimate, supply of food and fuelwood, etc. It was important in that case to distinguish between use and nonuse values. Use value was the value to human beings of using the various services from the ecosystems. But economists should take into account the fact that they could not always determine those values. For example, some of the values could occur in the future. Although people could not always predict those values, they could possibly want to keep the option of using those resources in the future. That meant preserving the functions of the ecosystems - the value of keeping the option open. Nonuse value was a tricky concept, but a very important part of the global interest in reducing biodiversity loss. That was a value humans assigned to the preservation of biodiversity which had nothing to do with actually using those resources or their services. For practical estimation, it was quite necessary to make that distinction. He stressed that, in order to conduct valuation studies, economists and ecologists had to work together.
77. He indicated that the third research area was determining the driving socioeconomic forces behind the destruction of habitats and ecosystems. Here one could differentiate between proximate and underlying causes. The proximate causes were phenomena such as changes in land use. But developing a basic understanding of the underlying causes was much more important - the socioeconomic factors behind the changes in land use and the destruction of habitats. Conventional market failures and externalities were certainly among those causes, but the institutional structure and the

way in which property rights were defined and enforced were also extremely important. Economists should remember that once they had identified a particular set of property rights, then they had to find a way to enforce those rights. There were many examples of nature reserves which governments had set aside but for which the property rights were not enforced. So fuelwood collection had continued within the park boundaries. Economists should therefore examine the various forms of property rights, but not necessarily with a view to throwing out common property systems. Rather, they should try to determine the most appropriate institutional setup.

78. He mentioned, in connection with the third research area, that economists should also examine the general equilibrium effects spread through the system by particular factors. For instance, the interest rate had been mentioned as a very important factor in that regard. The market interest rate was determined by the sales and purchases of various capital assets but that excluded many other very important assets such as air, ecosystems and water. Those were assets for which there were no property rights and which could not be transferred from one owner to another. The productivity of those assets was therefore not reflected in the interest rate. Using the market rate of interest in determining the allocation of environmental goods and services thus involved a strong bias. Economists should therefore look into what the appropriate rate of interest would be if the productivity of natural capital were taken into account in its determination.
79. He indicated that another example of underlying causes was the role of macro-economic factors and policies in habitat loss and biodiversity loss. Mr. Binswanger at the World Bank had examined the destruction of rain forest in Brazil and had found that to a large extent, the destruction was due to the income tax structure and the land tenure system. The income tax structure created a tax haven in agriculture. Profits from international trade were therefore invested in agriculture, thus increasing the rate of the destruction of the rain forest. In order to get tenure to land, people had to show that some activity was taking place in rain forest and so trees were cut down. By changing the tax structure and the land tenure system, the Government could reduce biodiversity loss and also achieve some pure efficiency gains in the rest of the economic system. There was thus a great need for a better understanding of the role of trade, macro-economic policies, etc. in biodiversity loss.
80. He stated that the fourth research area was how to design policies and institutions to help solve the problem of biodiversity loss. Those

policies should obviously be based on an understanding of the underlying causes highlighted in the third research area. If property rights were the problem, then economists should try to find institutions which would better respond to people's demand for the services provided by the ecological system. That could imply the need for a price reform of agricultural outputs. Prices which were too low could be providing farmers with little incentive to decrease soil erosion, which could have an effect on the loss of biodiversity. There was also a need to analyse possible designs of international institutions since biodiversity loss was to a large extent an international problem. The world did not have international institutions through which it could express the nonuse values of biodiversity in practical terms. Some of the values associated with the preservation of biodiversity were global public goods and could not be privately appropriated. Estimating the nonuse values would mean nothing unless the international community was prepared to discuss the design of such institutions. Then the question was to design the operational modes for those institutions which did not necessarily involve resource transfers to the countries involved. Those institutions could take many possible forms and a very thorough discussion on their design was required.

3.2 *Climate Change*

81. The meeting then discussed the issue of climate change, beginning with a short presentation by Mr. Grubb. He first pointed out that a framework convention on climate change would almost certainly be ready for signing at UNCED. The Convention would, however, contain few substantive commitments on abatement or on resource transfers. He gave a quick description of the important economic issues that had surfaced in the discussions on a framework convention corresponding to the axis to which he had referred earlier in the meeting. He stated that valuation was a difficult issue in the negotiations. While the USA wondered whether climate change was an economic issue serious enough to warrant a convention, most developed countries felt that humanity should not tamper with the global climate. On the other hand, many developing countries saw climate change as being so far ahead that they did not need to worry much about it now. Second, there were differing views on abatement costing. Many countries had concluded that abatement of emissions of greenhouse gases would not cost very much and could be beneficial. On the other hand, the USA felt that it would be costly, while developing countries were fearful about abatements. Third, and on a related note, there were thus obviously different views on decision analysis under uncertainty.

82. Mr. Grubb stated that the discussion on additional financial resources within the negotiations had focused on the principles for which such resources should be provided. The discussions had spent very little time on domestic economic mechanisms. Other than the general idea of an international fund, the discussions had not considered any details for such a fund. He indicated that equity was a central issue in the discussions of a framework convention, particularly with respect to the assigning of responsibilities. The issue of international economic relations had been significant in rhetorical terms. Many governments said the problem of climate change reflected the international economic order and its unfairness. In practice, though, if the convention met those countries specific concerns then they would probably sign. He added that trade had not surfaced at all as an issue in the negotiations.
83. He then highlighted how those economic issues could change, when the negotiation process moved beyond the framework convention to a protocol. First, valuation would continue to be important. The question was how much the world and individual countries were prepared to spend to address the issue of climate change. Abatement costing would also remain a difficulty due to differing beliefs among countries on how much abatement they should undertake. The conflict over decision-making under uncertainty could however be resolved, in principle, with all countries recognizing that they could not wait for full certainty before taking action on climate change.
84. He stated that the discussion of additional financial resources would shift to the specifics of abatement costing - how to calculate those incremental costs and how to value them in the long-term. Additional financial resources would also raise a host of complicated issues relating to compensation to developing countries for limiting or adapting to climate change. Domestic mechanisms, including domestic carbon taxes as a basis of an international regime, would probably remain a small issue, although it would feature in how countries approached the topic of climate change. Whether it was possible to achieve a consensus on the right international mechanism to use would determine, however, whether an agreement on climate change was reached at all. Regarding equity, different interpretations of this concept would define what was acceptable to various countries. Finally, regarding international economic relations and trade, a climate change agreement had large trade implications which would become important in the future.
85. Mr. Usher, Coordinator of Climate Unit, UNEP, then explained UNEP's role in the negotiations of a framework convention on climate change. He

first pointed out that UNEP's perspective was primarily a scientific one and that its priority was monitoring and assessment. UNEP's role had changed from identifying the issue to assessing the state of the atmosphere and the potential for climate change and its consequences. UNEP had become more involved in structures for managing climate issues, as the international perception of these issues had switched from one of wanting to know more about them to one of setting up management structures. While the process for dealing with depletion of ozone was already well under way, climate change was quite a bit farther back and UNEP had to go into a more formal approach to assessment than it had done in the case of ozone. UNEP's role in dealing with climate change was partly through its contribution to the World Climate Programme. UNEP was implementing one element of this programme, the World Climate Impacts and Response Strategies Programme (WCIRSP), which dealt with other issues in addition to climate change. Climate change was also assessed through the Intergovernmental Panel on Climate Change (IPCC). The IPCC was a UNEP/World Meteorological Organization (WMO) body, whose responsibility, in three working groups, was to assess the state of science and the state of the atmosphere and climate processes; to assess the impacts of any future climate changes; and to formulate response options.

86. He stated that the Intergovernmental Negotiating Committee for Climate Change (INC), the WCIRSP and the IPCC had identified as a priority requirement the need for country studies on the many different aspects of the climate change issue. In addition to other UNEP studies of a more scientific nature on climate change, the Governing Council in decision 16/41 required UNEP to encourage economic studies to assess the costs and benefits for individual countries of dealing with climate change. UNEP was therefore attempting to develop, with the assistance of the RISO/UNEP Collaborating Centre in Denmark, a methodology for assessing abatement costs. UNEP would then apply the methodology in a series of developed and developing countries with a view to making this information available to the ongoing negotiations on climate change.

87. He explained that the international discussions on climate change, including UNEP's role in those discussions, were different from those on ozone. First, UNEP was responsible for the ozone discussions leading to the Vienna Convention and then the Montreal Protocol. Second, science underpinned the negotiation of the Montreal Protocol; UNEP was able to inject scientific opinion into the negotiations on the basis of which control measures were worked out. In the case of climate change, UNEP was considered one of the contributors to the discussions. Furthermore, there

was no clear relationship between the negotiations and the science, and volunteered scientific opinion was not necessarily accepted in the discussions. Thus, the process of reaching an international agreement on climate change was much more complicated than that of ozone.

88. Mr. Zeinelabdin, Organization of the Islamic Conference (OIC), stated that the whole issue in the climate negotiations was one of convincing policy makers to finance an international convention. The role of economists was then reduced to a very specific subject - what were the best methodologies for CBAs to convince the policy makers. He added that one of the most important issues was how to increase global awareness of the necessity of ecological conservation and how to incorporate ecological considerations into economic analysis.
89. Mr. Rubenstein argued that how people perceived science, and not science itself, was the issue. If people perceived that the issue was a lack of scientific knowledge, then they would do nothing about the environmental problem under consideration. It was therefore necessary to look at the other obstacles that were blocking the negotiation of a convention on climate change.
90. Mr. Usher agreed that science was not the issue. He explained that there were many national considerations in addressing the issue of climate change. Those took precedence over the need for environmental protection.
91. Mr. Rubenstein proposed a model for addressing the issue. He stated that, as the science continued to provide more information, governments as a first step, could set a minimal entry level for abatement, with UNEP acting as a monitoring organization that would continuously assess the situation.
92. Mr. Usher agreed with Mr. Rubenstein that the Montreal Protocol was dynamic in that it was open to incorporating changes. He stated that the approach had, however, at least one deficiency - it created the perception that the problem had been solved.
93. Mr. King pointed out that economists were asked to provide support for the arguments of scientists. The scientists had presented their argument but felt that policy makers were not doing anything about the problem. But economic logic or arguments had seldom influenced political action. The focus should therefore be on economic tools, such as the techniques of valuation, rather than on questions of strategy for problem solving.

94. Mr. Grubb responded that, although valuation was an important and difficult issue, it was not the only one. Valuation was not needed to know that the international community and governments should do something about climate change and yet they were doing nothing. There were all sorts of political, economic and institutional obstacles involved other than just valuation.
95. Mr. Chipman, University of Birmingham, stated that the economic implications for individual countries were clearly time-dependent. In valuing the benefits of action, it was important that temporary advantages did not mask long-term disadvantages to certain countries.

3.3 *Desertification*

96. The meeting then discussed the issue of land degradation and desertification. Mr. Magadza gave a short presentation highlighting some of the important economic issues relating to those problems. He emphasized the importance of examining land degradation and cost allocation in environmental management in the context of different types of land tenure and at different levels (farm, national and regional). He pointed out that land-use practices in one country had impacts on neighbouring countries, either in the form of emissions or in the changes of the local climate. He cited the example of Lesotho, where the physical amount of land available for cultivation had actually diminished due to gully erosion. That erosion had changed the local hydrology and the characteristics of land. In Lesotho, all the land was held by the monarch. There was no free commerce in land, which also had no monetary value. When that land was degraded, the question was who should bear the cost.
97. He compared the situation in Lesotho with that in Zimbabwe, where there were three types of land tenure systems - communal or traditional land tenure system (as in Lesotho), commercial land areas, and national parks and conservation areas. Land fertility on communally held areas had deteriorated noticeably due to overuse and the resulting erosion. That erosion led to the siltation of waterways, which affected Zimbabwe's neighbours. For instance, Mozambique periodically experienced floods, when Zimbabwe received rain. In contrast, those environmental problems were much less severe in commercial land areas. The difference was a matter for policy review in terms of changing the status of land tenure to put some value on the environmental aspects of land.

98. He stated that the third category of land use - national parks and conservation areas - was coming under increasing pressure for resettlement. But much of that land was agriculturally marginal and not suitable for grain production or even, questionably, livestock grazing. It was therefore necessary to find some other use that was economically more viable. He cited the example of the Mopata Gorge on the Zambezi River. That gorge was saved from being chosen as a dam site by a study that argued that the land was far more profitable as a nature reserve than as a hydroelectric dam. The value as a nature reserve was calculated based on elements such as how much foreign tourists were willing to pay to come and visit the reserve to see elephants. Was that a tenable way of valuing a recreational facility that was not accessible to the majority of the country's citizens? He stated that, as an ecologist, he saw the value of the Zambezi valley as its value as an ecosystem which had not been altered by humans. In addition, 80 million people depended in one way or another on the products of the Zambezi River system, which could also provide ecological services in the amelioration of local climate change. But methods for valuing that service were not clear.
99. He summarized the main issues he raised in his presentation. First, how should economists put a value on ecosystems? Second, how should economists put a value on recreational facilities which were not accessible to everybody? Third, there was a problem in allocating costs and benefits associated with communally-held resources. Such resources appeared to have no monetary value, but had a use value.
100. Mr. Rozanov, Special Adviser to the Executive Director of UNEP on Desertification, then gave a presentation on the economic issues of desertification. He began by stressing that desertification was a large economic and social, as well as physical and ecological problem deserving and requiring world attention. The major problem for UNEP was that, despite all the general discussions about the economic and social consequences of land degradation and desertification, UNEP did not have any reliable economic analysis of the phenomenon. The recently-produced Secretary-General's report on the Implementation of the Plan of Action to Combat Desertification (PACD) had assessed the need for financing of the PACD. While the main topic of the report was where to get funds to combat desertification, it did not contain any good regional data on the costs of desertification and the benefits of combating it. In addition, the Report of the Executive Director on the Status of Desertification and Implementation of the PACD contained only two pages on the economic and social aspects of desertification.

101. He explained that UNEP did not know the relationship between soil degradation and economic performance or production. None of the national, international or regional desertification institutes were conducting an economic analysis of the problem, and thus there were no data on those economic losses. UNEP therefore had to use its resources to invite some consultants to produce a simple methodology for assessing the economic consequences of desertification. The methodology used some information and data based on some studies and general evaluations to determine the average loss per hectare in monetary terms in areas that were slightly, moderately and strongly affected. It was thus estimated that the world was losing US\$42 billion per year because of desertification. UNEP then used a simple methodology to also estimate the cost of rehabilitative measures for the three categories of degraded land. Those figures were compared with those estimated for the loss due to desertification, and it had been found that the ratio of costs to benefits of rehabilitating degraded land was approximately one to three. An added problem was the very long-term nature of returns in investment in land protection, which could take 20 or 30 years to produce any benefits. UNEP was thus asking the world to invest large sums of money in the PACD knowing that the benefits would not materialize for 20 or 30 years. But the world community was not willing to invest in something with such a long return. Nor would farmers invest in land rehabilitation in the absence of short-term returns.
102. He indicated that UNEP was presently considering different strategies for combating desertification. When the PACD had first been prepared, it had relied primarily on technical solutions. But UNEP had then realized that economic, social and political solutions could be much more effective and less costly than technical solutions. By forcing farmers to care for their lands by investing in irrigation, erosion control, fixation of sand dunes, etc. solving the problem of desertification would be made much easier.
103. He stated that the economic priorities relating to desertification which UNEP would present to UNCED were to invest first in protecting unaffected and rehabilitating slightly affected land. Those were the least expensive measures. The next two priorities were to invest in the rehabilitation of moderately affected and strongly affected areas respectively. That hierarchy of priorities was based on the current fiscal and financial situation of the world. But were those priorities correct economically? The analysis on that was vague, because the moderately affected areas would in time become strongly degraded. What was cheaper in the short-run - investing in slightly affected areas - could therefore be more expensive in the long-run. He stressed that UNEP did not have a methodology for calculating those

tradeoffs and assessing the economic impacts of land degradation. UNEP needed that analysis for convincing policy makers and funding agencies of the necessity of investing in combating desertification.

4. *Possible Role of UNEP in the Field of Environmental Economics*

104. Mr. Ndegwa stated that, even if the costs of desertification doubled, the lack of funding would still represent a problem, since desertification affected primarily the developing countries. Unless desertification was linked to the welfare of industrialized countries, they would continue to have little interest in the issue and the efforts to combat desertification would therefore remain modest. On the other hand, biodiversity interested the industrialized countries because they could benefit from its conservation through tourism, products for medicine, etc. He also mentioned that dealing with land degradation, for example in Africa, required dealing with at least two other areas. Those were population growth, which was not exclusively a domestic issue, and trade practices which continued to put more stress on land resources.
105. Mr. Winpenny argued that desertification and soil erosion were separate issues. Desertification affected arid environments, while soil erosion affected semi-arid and humid areas. He argued that the economic methodology for assessing soil erosion was in fact reasonable. Many studies had been done on the issue, which suggested that measuring the on-site costs of soil erosion appeared to be much easier than measuring the off-site costs. The on-site costs had been documented in many studies and had been used in countries such as Australia and Mali to advise policy makers as to which lands they should concentrate on for rehabilitative or protective measures. The greater problem was a lack of data which scientists and agronomists needed to collect.
106. Mr. Magadza responded that an assessment of the costs of land degradation in Zimbabwe had been undertaken by taking into account the extra distance women would have to walk to collect water and firewood. By costing the extra time with the minimum wage, the total cost came to \$1.6 billion. But what that figure actually meant or to whom the costs were allocated was not clear.
107. Mr. Mäler agreed with Mr. Winpenny that good studies did exist on the economics of soil erosion and that the problem was the availability of data. He suggested that UNEP could launch a programme for establishing a databank on soil erosion, which could fit into economic models. In addition,

he pointed out that, although discussions had focused on the need for funding for the preservation of biodiversity and the prevention of soil erosion, more emphasis should be placed on the local incentive structures and on finding policies for changing the structures to combat those problems. With regard to the importance of the land tenure system in causing soil erosion in Zimbabwe referred to by Mr. Magadza, Mr. Mäler stated that there were agricultural policies that could help rectify that problem.

108. Mr. Heller also emphasized that economists should consider the importance of the institutional structure in a dynamic context. He referred to two conclusions of some work recently completed by Prof. Partha Dasgupta on the village economy. First, Prof. Dasgupta had noted the importance of the structures for managing resources. In the Indian subcontinent the ownership of common resources, which had been managed in certain ways under colonial law and in certain ways under traditional law, determined the local incentive structures. Second, as the costs of gathering wood and water began to rise because of soil erosion and loss of resources, the incentive for parents was to have larger families in order to distribute the additional costs of gathering resources over a larger number of children. The increase in population then led to increased environmental degradation, producing a vicious circle between those two phenomena. Economists should therefore address that issue by first focusing on shifting institutional arrangements to try to arrest, to some degree, some of the dynamics which were leading in perverse directions. Then they could deal with the question of rehabilitation, which would never be addressed until the institutional setup had been straightened out to some degree.
109. Mr. Nickum stated that the East-West Center had conducted some studies on communal property. Those studies showed that communal property rights were not necessarily inferior to private property rights. In determining the optimum institutional structure, economists should therefore look at modifications of the rules within which the communal property operated.
110. Mrs. Parikh indicated that the IGDR had looked at those problems in a somewhat different context. The UNCED Secretariat had asked the IGDR to prepare a paper on consumption patterns. The study found that although developed countries contained 75 per cent of the global population, their consumption of meat and milk was about 28-30 per cent and that of cereals about 50 per cent of the global consumption. But developing countries had almost as much livestock per capita as developed countries. That meant

that the yield of livestock in developing countries was perhaps one quarter of that in developed countries. Too many animals with too low a yield implied overgrazing and land degradation. Thus, environmental degradation in developing countries was largely a question of technological backwardness and poverty. It could thus be possible with technological inputs and aid to mitigate some of these effects. She added that calculations of tradeoffs depended on the level of income and development. At lower levels of income, people could not make as many tradeoffs. Thus, in developing countries, even a few million dollars could tilt the balance in favour of exploiting nature versus preserving it. But that also depended on some kind of value system and who was in charge in the government. She emphasized the importance of the relationship between poverty and the environment and the need to develop a better understanding of that relationship.

111. Mr. Mäler agreed with Mrs. Parikh that poverty was a very important issue, particularly with respect to biodiversity loss. Poor people could often have holdings of only natural assets. Economists should therefore be careful about advising governments to interfere with those holdings, since such interference could result in further impoverishing the poor or in destroying their limited assets.
112. With respect to the linkages between poverty and the environment, Mr. Winpenny also referred to the work of Mr. Dasgupta. One of the conclusions was that poverty itself was not the sole cause of environmental degradation in the Indian subcontinent. The interesting point was that the poor were more dependent on common property resources than the rest of the population. Because the poor did not own assets, they depended disproportionately on common property resources, which tended to get degraded. Thus, the root causes were partly the lack of assets held by the poor and also how the common property resources were organized and managed. An important area of work was therefore devising innovative ways of managing common property resources. In some respects, that could involve rediscovering traditional ways of managing resources, which recent actions had overridden or nullified.
113. Mr. Friend then assumed the role of meeting coordinator. He stated that the pertinent issues facing the meeting were the economic tools for analysing and dealing with environmental issues and the analytical framework for examining the linkages between the environment and the economy. He proposed that the meeting should come up with recommendations on what kind of framework to use for that task.

114. Several participants offered general comments on environment and economics and suggested possible areas that UNEP could focus on. Mr. Swingland stated that economists and ecologists needed a better means of dialogue between each other. He added that economists could help biologists by defining specifically which areas of biology needed strengthening and further research. Biologists for their part should start telling economists a little more about the directions in which economics should go to help with environmental management.
115. Mr. Andersson pointed out that economists and ecologists needed to cooperate not only on valuation but also to reveal cases where resources were being mismanaged. That cooperation should help to put pressure on those responsible for the situation, which was often the government. Cooperation was also necessary for better understanding environmental problems whose solutions should be concerned with incentives; otherwise there would be no solution. What economists proposed should, therefore, be in line with the needs and general aspirations of the people and in line with what governments could do. But governments should be under pressure to correct those situations.
116. Mr. Chipman emphasized the important role UNEP could play in the field of environmental education. He pointed out that there was a great need for better education and understanding of environmental issues both in the general public and in the case of regulations.
117. Mr. King highlighted another set of institutional problems which UNEP could probably help to address. Many international institutions for managing resource issues were designed around an older perception of the problems, which was too sectoral. Some institutional reform at that level was important in terms of characterizing the nature of those interrelated problems to decision makers. He also mentioned the concepts of uncertainty and irreversibility, which seem to appear frequently in the discussions of environmental problems. He stated that the purpose of science was to reduce uncertainty and to produce knowledge. Scientists could better contribute to the resolution of problems, if they would push themselves out of the scientific field into the real world of uncertainty. In addition, economists needed to link uncertainty, equity-related issues and market failures, and to determine which tools to use for that purpose.
118. Mr. Winpenny added that decision-making under uncertainty was an underdeveloped area in the economics of environmental issues. Another was other decision-making criteria which involved the whole area of decision

analysis, acceptable risk analysis and multicriteria analysis. UNEP could focus on developing those methodologies.

119. Mr. Heller said that problems of internal equity and intergenerational distribution were endemic to choices between alternative resource uses. For example, if Zimbabwe decided internally that it was better to put an area into ecotourism, then it would still have a series of difficult distributional questions to answer. How would the Government divide current ecotourism profits, because clearly the same people would not be profiting from ecotourism as from the exploitation of a coalfield, for example. Other interesting problems relating to moral issues also arose in those circumstances. But he stressed that those problems arose not because the issue was environmental or international in nature, but because the issue was primarily one of distribution of rents and the use of resources.
120. Several participants emphasized the need to examine and possibly reformulate the institutional setup at the international level with respect to resource rights in order to deal with environmental issues. Mr. Schuler indicated that there appeared to be a dichotomy in the meeting. On the one hand, there were those who wanted to further the understanding of valuation by engaging in grand and noble studies. On the other hand, there were those who wanted to make progress on valuation and environmental problems by conducting real-life experiments. The second group felt that the international community could make more rapid progress using the second approach. That could involve assigning in a collective fashion those property rights that did not exist for environmental resources and then seeing what countries were willing to pay for them. He admitted that such an approach of putting in place some kind of bidding mechanism was fraught with difficulties with respect to not measuring the values correctly. But that approach was probably less liable to error and more amenable to understanding the diversity among countries' tastes and preferences. The approach amounted to giving countries a stake in the environment and then letting them swap their claims. That would provide some measure of the valuation of claims in relation to what countries were willing to pay. UNEP could set up that process and then act as a clearing mechanism that provided valuable information to countries.
121. Mr. Rubenstein added that UNEP could thus ensure that the price was right by setting a charter of benefits and helping to police it.
122. Mr. Heller stated that some participants seemed to be expressing a preference to move to regulatory solutions. Others were interested in

moving to institutional solutions that could evolve or adapt to changing circumstances. Those institutional solutions would not necessarily be identical for different problems. He added that some of the characteristics of problems in environmental economics, such as decision-making under uncertainty, were not problems exclusively of environmental economics. For example, firms made decisions under uncertainty in formulating research and development budgets. The question therefore remained what type of institutions were best able to deal with problems endemic to the system such as extremely expensive or unavailable information. It was better to have more than one institution for dealing with decisions involving uncertainties in order to spread the portfolio.

123. Mr. Rubenstein expanded on Mr. Schuler's remark by stating that the meeting was faced with two major frameworks for providing UNEP with some sort of guidelines on environmental problems. The first involved planning and regulation. The approach was to model a problem first to determine the right values and then to implement procedures based on those values. The second framework involved the use of market mechanisms. That approach treated each issue as unique and requiring a specific set of tactics. The goal was to create some sort of clearing-house mechanism to adjust values and the buying and selling of resources rights to provide the necessary economic incentives. In that case, UNEP would need to act as a moderator and a monitor. The meeting had to decide whether to recommend the use of one of those frameworks or to run the two approaches in parallel.
124. Several other participants reacted to that second approach put forward by Mr. Heller, Mr. Rubenstein and Mr. Schuler. Mr. Grubb pointed out that one problem with creating an international mechanism and then allowing countries to trade their claims was where to start from. For example, such a mechanism for global climate change would need an initial allocation of rights or claims.
125. Mr. Friend stated that that approach did not incorporate intra-country concerns. To that, Mr. Schuler replied that how to allocate rights within a country was not an issue for the group.
126. Mr. Winpenny pointed out that a problem with the firm approach of Mr. Rubenstein was the policing aspect. The privatization of conservation benefits should therefore not be replicated on a large scale, although it was interesting on a local scale.

127. Mr. Grubb remarked that the discussions had highlighted how the various international environmental problems were similar in some respects and fundamentally different in others. Climate was fundamentally different from biodiversity in economic terms, because climate change involved quantifiable and continuous emissions. Economists could talk about overall limits, even if they could not value climate change. For biodiversity, on the other hand, the economist was forced to look at the subject on a project-by-project basis and determine which were the valuable areas. That implied a different structure to the economic analysis and the use of different instruments.
128. Mr. Potier agreed with Mr. Grubb that climate change, biodiversity and desertification were different issues. He stated that biodiversity and desertification, however, did not necessarily need a project-by-project approach. Instead, economists should examine the root cause of government or management failure that led to the problem. Economists should then look at how to rectify those failures with policy. He therefore strongly supported Mr. Mäler's comments with regard to his presentation of a research agenda for biodiversity. Mr. Potier indicated that economists and the environmental community were not paying enough attention to the problem of government failure. Governments were often providing the wrong signals to resource users by interfering in the market, giving subsidies, manipulating prices, etc. Even the basic costs of producing natural resources were not being recovered, which implied that people would pay less attention to saving or conserving those resources. He suggested that economists examine the issue of government failure first, before looking at how to rectify externalities.
129. The meeting then formed a committee of five members to draft an Action Programme and recommendations for consideration by the rest of the participants. After subsequent discussion and alterations to the document prepared by the drafting committee, the Meeting agreed upon a Framework for a UNEP Action Programme which appears in Annex II.
130. A brief account on the activities undertaken by represented Institutions in the field of environmental economics was presented by representatives of each institution. This is attached as Annex III.
131. Mr. Osman, on behalf of UNEP, then closed the Meeting by thanking the participants for their contributions and expressed UNEP's appreciation for the candidness of the discussion. Finally, he thanked Prof. Friend for acting as a coordinator.

132. Mr. Abaza thanked participants for their contributions and inputs in the discussions of the Meeting. He informed the participants that they would be receiving the report of the meeting shortly and added that UNEP would like to maintain contact with them. He also thanked Prof. Friend for acting as a coordinator.

Annex I

List of Participants

UNEP CONSULTATIVE MEETING ON ENVIRONMENT AND ECONOMICS

LIST OF PARTICIPANTS

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Annex II

Framework for a UNEP Action Programme on Environment and Economics

FRAMEWORK FOR A UNEP ACTION PROGRAMME ON ENVIRONMENT AND ECONOMICS

UNEP Consultative Meeting on Environment and Economics

PREAMBLE

The object of this document is to provide UNEP with a framework for managing resources whose use is shared, but where interests may conflict, and can have international, regional and/or national consequences. The programme must:

- be flexible;
- be equitable; and
- enhance development in a sustainable fashion.

UNEP within its mandate must put special emphasis on:

- identifying the causes and evaluating the environmental consequences of human behavior;
- facilitating the collection, harmonization and dissemination of scientific and economic data;
- coordinating the efforts to effect remedies that account for both short and long term solutions; and
- monitoring the extent to which major environmental problems are addressed and solved.

The problem solving process should not be one relying principally upon planning and subsequent regulation, but rather one that informs and brings together stakeholders--those whose interests may be affected by a change in the environment or rights to resources--to negotiate a common solution.

ARTICLE I. PROCESS FOR SOLVING PROBLEMS

Problems should increasingly be solved by adopting international or regional conventions or protocols that enable different stakeholders to come together and negotiate by trading rights within a defined property rights regime. The exact nature of the convention or protocol should depend on specifics of the problem. Generally, however, they should entail standards that can command widespread

agreement and provide appropriate incentives for parties to join in the conventions or protocols. Because of scientific uncertainty about important environmental problems, conventions and protocols should be flexible to permit the possibilities that:

- 1) new standards and timetables can be implemented as a result of the continuing accumulation of additional scientific data, through a system of effective monitoring and an increased understanding of environmental issues;
- 2) parties to the conventions or protocols may implement, for defined periods of time, less restrictive environmental standards, if they assume the risk of liability for compensating sanctions should more complete scientific information suggest that such limited standards should not generally be adopted.

ARTICLE II. THE ROLE OF UNEP

One of UNEP's most important roles should be as the stakeholder for the environment. It may often be necessary to provide the economic rationale to link a global environmental problem to national development patterns, or national environmental policies, and to link a national environmental problem (eg. dryland degradation) to international economic relations (eg. commodity terms of trade).

UNEP should:

- 1) identify the appropriate stakeholders in each area of conflict;
- 2) engage those stakeholders in drawing up the conventions, or protocols, that:
 - protect the environment
 - facilitate global equity
 - balance short and long term consequences of current actions
 - enhance educational opportunities for the stakeholders

so that social and economic welfare is increased;

- 3) maintain the flexibility of the convention by monitoring the extent to which outcomes are met and incentives are delivered. These should ensure that the benefits associated with them are commensurate with foregone development opportunities;

- 4) act as a clearing-house for incorporating new scientific findings into the reassessment process that updates and adjusts the outcomes and incentives;
- 5) build-up and maintain sufficient expertise in-house to identify and recruit outside expertise to deal with the issues as needed; and
- 6) ensure that the focus stays on issues central to environmental management.

UNEP's monitoring role should encompass: whether or not environmental objectives are met; and if economic incentives are in place and are operating effectively to address social concerns, especially in regard to access to resources and educational opportunities.

ARTICLE III. THE ROLE OF SCIENTISTS¹

Science should:

- 1) continue to get better data to enable UNEP to monitor compliance by stakeholders and for all stakeholders to better understand the nature and extent of the environmental problem, and its long-term consequences, and alternative technological solutions; and
- 2) model and use data to examine how different environmental problems interact.

A particular problem in finding effective solutions to environmental issues is the difficulty of incorporating scientific results in effective policy. Scientists should therefore attempt to provide results in a form that is suitable for evaluating economic and social consequences. UNEP should assist in this attempt through interdisciplinary task forces.

ARTICLE IV. THE ROLE OF ECONOMISTS¹

Economic analysis can:

- 1) develop methodologies to evaluate the endowments and economic interests of stakeholders;
- 2) advise stakeholders, including owners, producers, and users of resources about the private and societal costs and benefits of their decisions, with particular attention to the distributional consequences of those decisions;
- 3) advise UNEP and other stakeholders about the costs and benefits of alternative programmes to facilitate collective action and of the negotiation process itself;
- 4) advise each stakeholder on the best way to achieve economic goals within the framework;
- 5) advise UNEP about appropriate economic incentive mechanisms to encourage responsible behaviour;
- 6) illuminate the interrelationships between poverty and the environment; and
- 7) provide the basis for raising global investment finance based on a fair distribution of costs to deal with global environmental problems.

Article V. Proposed UNEP Action Plan on Environment and Economics

The following is the list of activities constituting a UNEP Action Programme on Environment and Economics which should build upon and extend UNEP'S past and ongoing work and be implemented in cooperation with the United Nations system, other international organizations, and/or the scientific community:

1. Encourage and promote dialogue between physical and social scientists in

1. "Scientists" and "Economists" are taken to include professionals with experience in the natural sciences, including the applied sciences, and economics respectively. The articulating of these roles is not meant to exclude the roles played by other disciplines.

2. Develop and apply methodologies for estimating the costs and benefits and evaluating the use, non-use and life-support values of options arising in the negotiations of international environmental agreements and in assessing their distributional impacts.
3. Support empirical research in the use of economic instruments in environmental policies *eg.* fiscal measures, such as taxes and subsidies, tradeable pollution permits and resource access rights.
4. Further develop valuation techniques, with particular emphasis on valuing services and damages incurred through the use of environmental assets including transboundary externalities.
5. Further develop and promote the application of the techniques of physical resource accounting.
6. Further strengthen the database of relevant expertise in the field of environment and economics and refine the process by which UNEP's programmes may benefit by consulting regularly with outside expertise, for example, by establishing a task force of experts on environment and economics to advise UNEP on the economic rationale with regard to its dealings with UN agencies and its role as global consensus builder.
7. Develop economic analytical frameworks for studying institutional arrangements to address global environmental problems, including transfer payments and funding mechanisms.
8. Analyze the socio-economic impacts of environmental change, particularly linking information and data on the physical environment and biological systems to those on human activities *ie.* the linking of geographic information systems to socio-economic data.
9. Analyze possible conflicts between international trade and environmental regulations and agreements *eg.* environmental standards as non-tariff trade barriers.
10. Initiate studies on the socio-economic driving forces behind environmental degradation. This would include studies of both market and policy failures, the linkages between poverty and resources and the role of different property systems in such linkages, and socio-economic institutional changes to reduce population growth.

11. Analyze the effects of international economic relations on environmental management. Important issues in this area include:

- **Commodity terms of trade**
- **Relief and restructuring of the external debts of developing countries**
- **Structural adjustment programmes**
- **Conditionality of aid**
- **Impact of export and agricultural product subsidies**

12. Develop and strengthen UNEP education and training activities in ecology, conservation and economics as an integrated discipline, and make these accessible to all interested actors at the international, national and local levels.

ACTIVITIES UNDERTAKEN BY REPRESENTED GOVERNMENTS AND INSTITUTIONS IN THE FIELD OF ENVIRONMENTAL ECONOMICS

Governments

The Russian Federation

Mr. Morozov, Centre of International Projects (CIP), Russian Federation, stated that, together with the other States of the former Soviet Union, the Russian Federation had been undertaking research in the field of environment and economics since the mid 1970s. That had been done by the Academy of Science as well as in high school institutions. CIP had been involved in the work undertaken by UNEP and other agencies in the environmental field since 1978. Among others, it had played an important role in desertification control, IRPTC activities and training in the field of environmental management.

Within the Russian Federation, the CIP had undertaken a lot of work on economic regulation, which was still considered to be a progressive approach towards the solution of environmental problems. With regard to the present economic and ecological problems, it was a high priority for the Government to elaborate the general approach to economic regulation. The Government was trying to develop a harmonized system to be applied at all levels for addressing specific issues. The Russian Federation was prepared to cooperate and contribute in the efforts provided by the World Community for the solution of world problems. The Federation had a very good scientific potential and was well able to contribute in scientific research.

Zimbabwe

Mr. Magadza, University of Zimbabwe, stated that the University of Zimbabwe, Lake Kariba Research Station had a patchy history with some interruptions during the 1970 hostilities. After independence it became an extension of the University's Department of Biological Sciences, being an inter-faculty facility for any research to be done in the Zambezi area. At first, research focused on the impact of Lake Kariba on the ecology of large mammals, then it became more aquatic-oriented. The main thrust of their current work was centered on the long-term environmental concerns of the Zambezi Valley.

International Organizations***The Economic, Statistical and Social Research Centre for Islamic Countries (SESRTCIC-OIC)***

Mr. Ugurel, SESRTCIC-OIC stated that the Centre was a subsidiary organ of the Organization of Islamic Countries (OIC) located in Ankara, Turkey. Its work programme, which focused on the areas of statistics, economic research, technical cooperation and training, was closely tied to the agenda of the OIC in terms of the specific interests of member countries. Environmental economics was still a new subject to the OIC. Its member States were now showing an interest in the field and the Institute was beginning to establish a programme and start research in the area.

The Organisation for Economic Co-operation and Development (OECD)

Mr. Potier, OECD referred to the booklet he distributed on Environment and Economics and stated that the OECD was presently focusing on the following main issues. First, on how to make a better use of market-based or economic instruments and the attempt to find the best mix of economic and regulatory instruments in order to achieve environmental objectives. The OECD was about to update a survey, i.e. a critical analysis of OECD's experience in the field. The Organisation was also trying to undertake work on the packaging sector, especially on its trade implications and the barriers which the use of economic instruments might create to trade. New work was to be started on the role of incentives for promoting the dissemination of cleaner technologies. A major project on "Taxation and the Environment" was underway. The main objective of that work was to assess how and to what extent environmental and fiscal policies could be made compatible and mutually reinforcing. The OECD was also trying to develop an outreach programme, in particular with regard to countries in transition (Czechoslovakia, Hungary, Poland) to see how they might gradually utilize economic instruments. Work on the use of economic instruments in developing countries was also carried out by the Development Co-operation Directorate and the Development Centre. Second, in the area of valuation techniques, the OECD had done a lot of work regarding benefit estimates. Mr. Potier referred the meeting to the book written by Mr. A. Markandya and Mr. D. Pearce in this respect. OECD was now trying to develop a new manual with focus shifted from project appraisal to programme and policy appraisal. That was seen to be a difficult task because of the attempt to introduce the concept of sustainability in the approach. Third, in the area of trade and environment, the OECD was looking at the impact of trade on the environment as well as at the impact of environmental policies on trade, e.g. the application of the General Agreement on Tariffs and Trade (GATT) rules, the

harmonization of standards, etc. Fourth, with regard to the climate change programme, the OECD was involved in the "Green Model", trying to assess the abatement costs in different scenarios. In addition, the Organisation was carrying out work on the use of economic instruments for global warming in order to assist its member countries in this respect. Fifth, the OECD was currently continuing its work in the field of environmental resource accounting. Sixth, he informed the meeting that OECD's activities were presently also targeted towards projects dealing with the integration of environmental concerns into sectoral policies, e.g. agriculture, transport etc, with the aim of identifying the cause of mismanagement, whether it be market or government failure.

Universities/Academic and Research Institutions

The Environmental Research and Management Group, University of Birmingham

Mr. Chipman, Environmental Research and Management Group at the University of Birmingham, stated that the Institute included approximately 130 members of the University from different disciplines and departments. Most members were from the faculties of science and engineering, but there were also a number involved in environmental law, economics and public policy. The research activities of the group were varied. They included climate change, aspects of pollution, air, water, biological resources, public health, environmental process engineering. The Group provided an infrastructure for a multi-disciplinary approach to environmental research and teaching. It enabled interaction between the different disciplines and groups, e.g. between biologists and economists.

Mr. Chipman, who was the chairman of the research group, said he himself was mainly involved in the molecular detection of genetic toxicity, specifically in risk assessment.

Cornell University

Mr. Schuler, Cornell University, stated that the University was a private one with a strong research emphasis. As it was also the land grant college of New York State with colleges of agriculture and labour relations, it also had a public education mandate and an important outreach programme. The university had a strong commitment to inter-disciplinary approaches. He informed the meeting that he directed the Waste Management Institute involved with combustion and incineration methods as well as recycling and waste prevention. The research was focused on monitoring, laser techniques, bio-monitoring, numerical simulation, and on outreach-related research, i.e. assisting communities to reaching decisions on siting of landfills, etc. The Institute was a part of a much broader Center for the

Environment, which was presently attempting to institutionalize interdisciplinary research. Thus, five senior fellow appointments were planned. The Center for the Environment also had programmes on water resources, remote sensing, biological resources and ecosystems research.

The Durrell Institute of the University of Kent at Canterbury

Mr. Swingland, Durrell Institute of the University of Kent at Canterbury, stated that the Institute was established two-and-a-half years ago, when the research group became twice as big as the department. Whereas originally there were 25 staff members, there were presently approximately 70 people on the staff of the faculty. The Institute was a department of the University of Kent, but it also existed as an independent charity in the outside world. Principally, the Institute's researchers were biologists, but there were also some anthropologists, economists and political scientists. The Institute only dealt with postgraduate work. Most students had already been in full-time employment in their respective home countries, e.g. officers in environmental offices. Rather than carrying out pure research, students were trained in intensive courses for 6 months in the area of conservatory biology. Many students were full-time staff members of the UN or other international agencies, who took 6 months off to join the University. The staff came from all over the world, with lecturers changing according to the subject and progress made in it.

The Maryland International Institute for Ecological Economics

Mr. King, Maryland International Institute for Ecological Economics, stated that the Institute was established a little less than a year ago, with Mr. Robert Constanza as Director. As compared to the University of Maryland with its well known economic department and its traditional teaching of economics and also of environmental economics, dealing with particular types of externalities on a case by case basis, the Institute was dealing with the ecological system as the source of all pervasive externalities and looked for ways to handle them.

The institute had recently started an Ecological Economics Certificate Programme. Both undergraduate and graduate students were able to get a certificate of ecological economics while at the same time maintaining their other majors. That was seen as an intermediate solution until the subject really emerged and became marketable.

The Institute had reached a large cooperation agreement with the us Environmental Protection Agency (EPA) Office of Policy Analysis, where it dealt with the following topics: functions and values of wetlands, economics of

ecological restoration, and changes in environmental quality and effects on various types of economic benefits. Together with EPA, as well as some other groups, the Institute had developed a programme on Environmental Policy and Training. A US\$35 million 10-year-cooperation agreement had been reached with the United States Agency for International Development (USAID) to develop analytical tools in environmental economics and to provide technical assistance to countries in implementing environmental policy and to maintain development strategies. The Institute was also a member of the International Society for Ecological Economics and published a journal and a newsletter.

Princeton University

Mr. Rubenstein, Princeton University, stated that the University was a private American university that was set up in the traditional model of most American universities with strong departmental structures. The University was presently embarking on a special exercise with regard to the environment. There was not only a programme on environment, blending policy economics and scientific analysis but, in addition, all undergraduate students needed to take three laboratory science courses to understand how to pursue science and how scientists thought. They also needed to take policy and economics courses. The independent research project, which was compulsory for undergraduate students, also needed to be multi-disciplinary.

At the graduate and faculty levels, the University was also presently trying to pull together intellectual activities among different faculty members. Recently, two subcommittees had been established. The first subcommittee was to deal directly with science in order to bring laboratories closer to universities, to better link modeling and real world knowledge. Next to that "science prong" of the initiative there was a "consequences prong", which involved technology and policy. It was to study the impacts of global change, regional problems and to blend the skills of biologists, geochemists with those of policy makers and economists to actually undertake joint research projects and provide action plans to assist those trying to solve real world problems.

Stanford University

Mr. Heller, Stanford University, stated that the University was a medium-sized American university with some 13,000 students, 7,000 of whom were graduates and 6,000 undergraduates. It had a faculty of approximately 3,000, of whom some 200 worked full-time on environmental issues. The majority of researchers were scientists or engineers.

The programmatic work on environmental studies was coordinated in the Institute of International Studies, which coordinated research in four major project areas. In the field of genetic engineering and tropical diseases, research was conducted jointly with the National University of Mexico. It focused on the development of a vaccine, but that was being put into the context of demographic, economic and ecological research in order to understand the relationship between public health, changes in economic productivity, demographic consequences and the impact on the environment. In the management of dry tropical forests, the University, in cooperation with the Government of Costa Rica, was carrying out work on biology conservation. The Institute was preparing a substantial study on how to enforce environmental preservation in ways that were consistent with the interests of the local population, with particular emphasis on the legal and economic consequences. Regarding global warming, a project which included research on rice warming and methane released in Indonesia and throughout much of South East Asia was being conducted, as well as work on modeling, concentrating on the interactions of climatic systems and plant biology. In collaboration with a research institute in Japan, the Institute looked at different types of carbon taxation and their distributional and allocational effects. Regarding the building of international regimes, a group of people from the Business, Economics and Law Schools were working on the establishment of international regimes, including environmental regimes. This was largely done through the theory of multi-stage games, i.e. sophisticated game theory.

The Stockholm School of Economics

Mr. Andersson, Stockholm School of Economics stated that the Institute was the only private institute in Sweden. It had a strong tradition in international economics. Currently, it was trying to lay more emphasis on the study of environmental problems, somewhat more in the economics branch of the Institute than in its business branch. The School cooperated with other institutions in Stockholm in the field of the environment, for example the Economics Department and the Department of Systematic Ecology of the University of Stockholm, the Industry Institute for Economic and Social Research and the Beijer Institute. There was a good atmosphere for cooperation between the different institutions and members of different disciplines working together in the environmental field. The issues studied included energy, health, and the various connections to trade and investment in the international field.

NGOS/Research Institutions***The East-West Center***

Mr. Nickum, East-West Center, stated that the Center was established in Hawaii in 1960 by the United States Congress "to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperation, study, training and research". The definition of the Center's work had changed considerably over the years, depending on the United States Presidents. Presently, the Center was subdivided into a number of core institutes with a total of 63 research associates as staff.

Mr. Nickum informed the meeting that he himself was working in the Environment and Policy Institute, which was founded in 1977. The Institute then was well known for its work in the area of economic valuation, e.g. the early work by Messrs. Hufschmid and Carpenter and later by Mr. Dixon. The latest publication was that by Messrs. Dixon, Carpenter et al. on the Economic Analysis of Environmental Impacts of Development Projects. After Mr. J. Dixon's move to the World Bank, the Center had continued its work on economic valuation, e.g. work for the World Bank on the Economic Valuation of Urban Environmental Problems, focusing on non-market aspects of valuation and on Asian case studies.

Mr. Nickum, who by training was an economist and presently saw himself as an "institutional economist" with specialization in water, had done work on the applied institutional analysis in the area of conflicts over water use and was increasingly involved in the analysis of urban environmental problems.

The Center had four major programmes: renewable resources, risk resources, institutions and environmental management, and oceans and coasts.

The programmes on institutions and environmental management and that on risk resources were most directly related to economic valuation. The Institute was currently carrying out a lot of work on environmental priority setting and environmental risk assessment and ranking, in collaboration with the State of Hawaii. The Institute had also been active in the field of social forestry, drawing on data from the Asian and Pacific region. Several working papers had been published on the issue. An anthropologist would be working on environmental perception, especially on differences between agencies and clients.

Mr. Nickum informed the meeting that one of the Center's staff members, Mr. R. Carpenter, who was one of the originators of economic valuation, had lately been involved with priority setting for pollution abatement in China and was now

carrying out studies of biophysical measures for sustainability.

The Indira Gandhi Institute of Development and Research (IGIDR)

Mrs. Parikh, IGIDR, stated that the Institute was a non-profit, advanced research institute. It was multi-disciplinary, with an established PhD programme and was affiliated to the University of Bombay. They included disciplines like macro-economic policy, energy and environmental policy, industry policy and technology assessment. The disciplines were interlinked and all researchers had to know about more disciplines in addition to their own.

IGIDR recently prepared a paper on "Natural Resource Accounting for Soil Quality". The paper focused on when to use fertilizer, how the soil became degraded and how to see that the yield and cost reflected the declining soil fertility. IGIDR had also prepared a paper on the "Polluter Pays" Principle (PPP). It explained how the PPP was applied under different conditions and analysed particular aspects that had not been reflected in previous discussions. The Institute recently prepared a paper on "Consumption Patterns" for the Secretariat of the United Nations Conference on Environment and Development (UNCED). The paper discussed the amount of stress consumption patterns exerted as compared to that exerted by population growth. Presently, a paper was being prepared on Global Climate and Economic Instruments. The paper addressed issues such as how tradeable emission quotas affected transfers and emissions and how they would affect global negotiations, as well as how the use of a carbon tax and similar instruments related to the objectives that prevailed for developing and developed countries.

Other work, which IGIDR, in collaboration with other institutions, was involved in, included trade and environment with UNCTAD, environmentally sound and sustainable development with ESCAP, environment and human development with UNDP, natural resource accounting and climate change and India's Energy Policy options with the Ministry of Environment and Forest, India. A number of studies, reports and workshops in those areas had been undertaken by IGIDR.

Institute for Research on Environment and Economy (IREE)

Mr. Friend, IREE, stated that the Institute constituted part of the University of Ottawa. It was opened in December 1989 at a not particularly favourable time because of heavy university budget cuts. Presently, there were some research projects that were income-generating; apart from that client-oriented research, the Institute also did independent research.

The focus of the research was macro--perspective to environmental problems. The Institute was founded to formulate an overall view on the State of the Environment (SOE): a number of people involved in SOE reporting for Canada divided the country into ecological zones rather than provinces, and thus provided a completely different perspective of Canada. The group became aware of the tremendous concentration of population within a very small area - 55 per cent of the population on 2 per cent of the land surface. That brought about quite a different view of Canada's environmental problems. The Institute essentially employed an ecosystems approach to research, but it also looked at issues in terms of socioeconomic activities and the linkage of socioeconomic activities and SOE.

Presently, the Institute was undertaking an electricity generating project - the "Ontario-Hydro-Project", which was run by the Government. It involved a 25-year plan for increasing electric power. The Institute was looking at the ecological perspective of the plan. A second project focused on the Saint Lawrence Basin, using the framework of the linkages between socioeconomic activities and environmental change.

The Institute had been organizing workshops such as that on Barriers to Environmental Information. In March 1992 it organized a workshop on Information Policy, in cooperation with the Ontario Government. It was obvious that there was a lot of information available and that it had been collected by many different institutions, but information remained fragmented. The Institute had developed a proposal for the provincial Government to have a policy within which information could be integrated in a specific framework.

Most of the Institute's work had focused on Canada and the Federal Government. It was presently discussing collaboration with the International Development Research Centre (IDRC) in Vietnam and possibly in Africa. A project proposal regarding the polluted "Black Triangle" in Central and Eastern Europe had also been developed.

The Institute had a small number of permanent staff and a good number of academics and consultants, some of whom were Government officials. It comprised approximately 80 members, including graduate students. The Institute itself was multi-disciplinary, with academic members from all faculties of the University with an interest in the environment, economics, law, administration, and engineering. Because of the work done on ecological health, even some members of the medical faculty were involved in the Institute's work. The Institute was presently considering setting up a new journal, together with Mr. R. Constanza, on ecosystem health. The Institute was involved in the International Society for Ecological Economics, which also published a journal. No courses were given by

the Institute, but individual members did teach subjects such as environmental accounting. Also, some public education was provided through public lectures on issues such as, for example, environmental ethics.

The Overseas Development Institute (ODI)

Mr. Winpenny, ODI, stated that the Institute had a staff of 30 professionals. It did independent research. As it had no regular funding support, it offered its services at a fee. With regard to the Consultative Meeting and UNEP's specific interest, Mr. Winpenny indicated that the Institute was currently involved in nine projects. The first was on dryland carrying capacity in Africa which focused on pastoral systems. The second was on management of tropical dry forests, which looked at the institutional ways of managing tropical dry forest for the benefit of the people who depended on them. The third was on management of water, which focused on the economic and institutional options for management. The ODI was working on several international comparative cases. The fourth was on the review of the state-of-the art of economic valuation. As a follow-up to this review, the ODI was carrying out some consultancy work, trying to apply well-known approaches to particular cases. The fifth was on work for the Overseas Development Administration on the design of sustainable development projects. The ODI was presently looking at 6 different projects to see how they met the criteria of sustainability. The sixth was a project on environmental change in the Machakos area of Kenya. In that project, which was coming to an end, the environmental changes on the area over a time period of 40 to 50 years were examined. The researchers came up with interesting empirical results, which were said to challenge the conventional wisdom about environmental degradation in dry areas. The seventh was on work for the World Bank on national environmental policy, where the ODI participated in missions to Nigeria and Egypt in that respect. The eighth was on work on NGOs, which focused on the role of NGOs in the technology diffusion among marginal small farmers in fragile areas in the Himalayas and South America. The last project was on work on adaptive economy. In that work, the ODI focused on a more general topic and examined how the economies adapted and how the macro-economic policy could be framed in circumstances of uncertainty. The ODI researchers were looking at countries like Bangladesh and others that were likely to be affected by global warming and other environmental changes. ODI had gathered a number of leading economists to see what guidance could be given to those countries about the formulation of their economic policy under those conditions of uncertainty.

On a general level, the Institute was organized into a number of networks with many international collaborators, who exchanged views and sent in papers which were then disseminated by the ODI.

The Beijer Institute for Ecological Economics

Mr. Mäler, Beijer Institute for Ecological Economics, stated that the Institute was created in 1977 through donations from the private Beijer Foundation. After the first director left the Beijer Institute for the Stockholm Environment Institute, it was decided to change the Beijer Institute into an Institute of Ecological Economics. It started as such an institution in 1991, shortly before a similar agency was founded by Mr. R. Constanza at the University of Maryland.

The Institute had a small permanent staff. It was cooperating closely with the Stockholm School of Economics, since the Director of the Institute had the Chair of the School. The Institute was also cooperating closely with the Department of System Ecology at the Stockholm University. It had created a network of international scholars from all parts of the world, who regularly visited them as guest scholars or attended workshops.

The Institute's work was organized in a broad range of research programmes. The first programme focused on the economy of biodiversity loss. It involved a number of projects, some of which were centered in Sweden. The study of the overgrazing problem in Botswana, for example, looked at macro-economic policies in terms of changes in trade, etc. to find out the impact on the size of the herds, with the help of CGE models. Some researchers were studying deforestation in Costa Rica through a model approach. Moreover, some studies were being carried out on the functions of wetlands and the value of conserving its functions. More specifically, the Institute was about to finish a study on the economics of mangroves. That was of particular interest, as the Institute was trying to develop a new theory framework for the valuation of such resources. So far, most valuation techniques had been developed for environmental problems in Europe and North America, mainly to deal with pollution problems.

As the household in Third World countries was very important in relation to environmental resources, the Beijer Institute was trying to model household production using environmental resources with the knowledge that the household production function made it possible to value environmental resources further. The study would include both theoretical extensions and empirical applications. Another research programme involved the mathematical complex non-linear dynamic economic-ecological systems. In ten years time that would possibly be of interest to UNEP, but presently it was not of any practical use.

Later in 1992 the Beijer Institute would start a programme on institutions and environmental resources in general and on property rights in particular. The aim was to look at how societies and communities organized themselves in order to

promote the efficient use of resources, how those processes worked, and what the defects as well as advantages in those processes were. The Institute also had a programme on economics of the Baltic Sea, specifically in the Baltic Drainage Area, which involved cooperation with the other countries around the Baltic as well as with "Seasearch", a research group with Mr. D. Pearce in London.

Under the Institute's training programme, a workshop for Civil Servants in Planning Commissions and the Ministry of Finance would be held in collaboration with IGDR and funded by SIDA. The Institute was also organizing a workshop on environmental economics in Colombo (Sri Lanka) in December 1992. It was also developing special relations with the National University in Costa Rica, both in teaching and in research.

United Nations Environment Programme (UNEP)

Mr. Abaza and Mr. Dabholkar, UNEP, gave a brief account of UNEP's activities in the field of environmental economics in which they informed the meeting that the integration of environment into development policy and planning had always been an important element in UNEP's programmes. Initially, focus had been on the conceptual framework, e.g. the clarification of the linkage between environment and development, where economics played an important role. UNEP then entered a methodological phase, with work being done on cost-benefit analysis, environmental impact assessment, natural resource accounting and on the application of these methodologies. UNEP also provided training and advisory services to countries in the form of institutional capacity building within governments for sustainable development. Lately, attention was being devoted to the impact of international economic relations on the environment. Furthermore, UNEP was also devoting particular attention on how economics could assist UNEP in promoting the negotiation and implementation of international agreements and programmes.