

**UNITED NATIONS ENVIRONMENT PROGRAMME  
(UNEP)**

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**COMMITTEE OF INTERNATIONAL DEVELOPMENT INSTITUTIONS  
ON THE ENVIRONMENT  
(CIDIE)**

**WORKSHOP ON ENVIRONMENTAL AND NATURAL  
RESOURCE ACCOUNTING**

**SUMMARY RECORD**

**February 1992**

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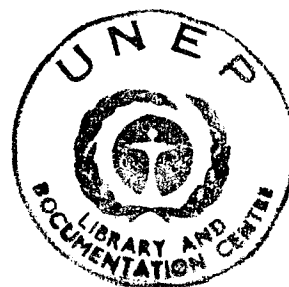
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**WORKSHOP ON ENVIRONMENTAL AND NATURAL RESOURCE  
ACCOUNTING**

**Nairobi, 24-26 February 1992**

**SUMMARY RECORD**

**Hussein Abaza  
Workshop Organizer and Rapporteur**



**Contents**

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	<i>Page</i>
<b>INTRODUCTION</b>	<b>1</b>
<b>1. Opening Remarks by the Executive Director</b>	<b>1</b>
<b>2. Sustainability and Economics of Assuring Assets for Future Generations</b>	<b>2</b>
<b>3. Methodology for the Calculation of Sustainable National Income</b>	<b>8</b>
<b>4. Feasibility of Environmental and Resource Accounting in Developing Countries</b>	<b>11</b>
<b>5. System of Integrated Environmental and Economic Accounting (SEEA)</b>	<b>15</b>
<b>6. Application of the System of Integrated Environmental and Economic Accounting (SEEA) in Papua New Guinea and Mexico</b>	<b>22</b>
<b>7. Second Meeting of the Intergovernmental Working Group on the Advancement of Environment Statistics</b>	<b>28</b>
<b>8. Natural Resource Accounting in the Developing World: A Neoclassical Approach</b>	<b>32</b>
<b>9. Presentations by Representatives of Governments, Intergovernmental and Non-governmental Organizations on the Ongoing Work on ERA</b>	<b>43</b>
<b>Governments</b>	
People's Republic of China	44
Finland	44
Germany	45
Indonesia	46
Japan	47
Norway	50
Russian Federation	52
Sweden	54

<b><i>International Organizations</i></b>	<b>54</b>
United Nations Economic Commission for Europe (ECE)	54
Food and Agriculture Organization of the United Nations (FAO)	55
Regional Activity Centre for the Priority Actions Programme of UNEP - Mediterranean Action Plan	55
United Nations Conference on Environment and Development (UNCED)	55
Organisation for Economic Cooperation and Development (OECD)	56
<b><i>Non-governmental Organizations (NGOs) and Research Institutions</i></b>	<b>56</b>
East-West Center	56
Thailand Development Research Institute (TDRI)	57
World Institute for Development Economics Research (WIDER)	57
World Wide Fund for Nature (WWF) International	58
<b>10. Concluding Remarks</b>	<b>58</b>

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<i>Annex I</i>	<i>List of Participants</i>	63
<i>Annex II</i>	<i>Conclusions and Recommendations of the Workshop</i>	75

## ***Introduction***

1. At the twelfth meeting of the Committee of International Development Institutions on the Environment (CIDIE) held at the Inter-American Development Bank in Washington from 29 April-1 May 1991, an Action Programme was adopted for implementation by CIDIE. The Action Programme included the convening of a workshop on environmental and natural resource accounting by the United Nations Environment Programme (UNEP). The Workshop was convened at UNEP headquarters in Nairobi from 24-26 February 1992.
2. The Workshop was attended by representatives from the People's Republic of China, Finland, Germany, Indonesia, Japan, Netherlands, Norway, Russian Federation, United States of America, United Nations Economic Commission for Europe (ECE), Food and Agriculture Organization of the United Nations (FAO), United Nations Environment Programme (UNEP), Statistical Office of the United Nations, United Nations Conference on Environment and Development (UNCED), Islamic Development Bank (IDB), Organisation for Economic Cooperation and Development (OECD), East-West Centre, Institute for Research on Environment and Economy (IREE), Thailand Development Research Institute (TDRI), World Institute for Development Economics Research (WIDER), World Wide Fund for Nature (WWF) International. In addition, three individual experts attended in their personal capacity. The list of participants is attached as Annex I.

### ***1. Opening Remarks by the Executive Director***

3. The Workshop on Environmental and Natural Resource Accounting (ERA) was opened by Dr. Mostafa Tolba, the Executive Director of UNEP, who welcomed the participants. He stated that although the Workshop was part of the CIDIE Action Programme adopted at its twelfth meeting, the Executive Director also hoped that the Workshop would provide UNEP with policy guidance in the field of environment and economics. The subject of the Workshop reflected the high priority accorded by UNEP to the many aspects of the relationship between environment and economics.
4. The Executive Director identified three issues of major concern: the first concerned the need to develop a methodology to link national development plans and activities to the natural resource base within an accounting framework. He wondered whether it was possible to stipulate the effects of a development plan on the resource base before implementation rather than make an assessment afterwards. He also questioned whether it was possible to advise decision makers of the various options for achieving a

specific development plan objective, such as growth in Gross Domestic Product (GDP), and of the impacts the various options would have on natural resources so that decisions could be taken with full knowledge of the consequences. The second issue was the question of whether environmental accounts should be integrated into the system of national accounts or form a set of satellite accounts. The third issue concerned appropriate valuation techniques and methodologies for pricing natural resources. He pointed out that information was needed in the negotiation of international conventions to determine, in practical terms, how countries were to be compensated by the world community for conserving natural resources. For example, how could one value the various goods and services provided by forests? He asked if it was necessary to develop tailor-made methodologies for each country or whether standardized methodologies could be devised and applied for developed and developing countries. He emphasized the importance of such issues in the various forthcoming negotiations and conventions. The Executive Director observed that it was sometimes difficult to reach a consensus on optimum solutions and suggested that the Workshop should aim at providing options for addressing these issues.

5. In response, Mr. Richard Norgaard, University of California at Berkeley, who volunteered to function as a coordinator of the Workshop, stated that the Executive Director's statement raised important issues. He pointed out that it would certainly be desirable to have a correct System of National Accounts (SNA) and that many countries were making progress in achieving that. He shared the Executive Director's concerns with regard to arriving at the right values for different environmental goods and services, and added that economists would be grappling with that issue for some time.

## 2. ***Sustainability and Economics of Assuring Assets for Future Generations***

6. Mr. Norgaard then outlined his work on valuation, accounting and the politics of sustainability contained in his paper ***Sustainability and the Economics of Assuring Assets for Future Generations***. Over the past decade, the techniques of ERA had been seriously pursued and had undergone a continual evolution. At the same time, society's understanding of sustainability, and particularly the political understanding of sustainability incorporating increasingly global phenomena such as biological diversity and climate change, had also evolved dramatically. During the past decade, the understanding of environmental valuation had also increased. Moreover, the political awareness of sustainable development had become more sophisti-

cated and sensitive to the complexity in the interactions between the use of resources and how those uses affected the economy and how the economy in turn affected society's environmental sustainability.

7. He outlined a hierarchy of the social decision-making processes with individuals acting within markets at the bottom and in the framework of collective or government mechanisms at the top. He pointed out that adopting sustainable development meant increasing enlightenment all the way up the hierarchy. As environmental changes became irreversible and more complex, society needed a planning process for providing guidance for congressional political decision-making, which was informed by constitutional law which, in turn, was guided by ethical decision-making.
8. Mr. Norgaard highlighted a dilemma involving a circular loop with respect to environmental accounting. The objective of modifying the SNA was to generate different economic signals to force decision makers to plan for sustainable development. That would cause economies to work differently which was one of the main objectives of those advocating sustainable development. Those economic changes would result in economies generating different prices in the SNA, leading to more changes in the planning process. There was thus a circular feedback that the profession of resource and environmental economics had avoided by working with partial equilibrium analysis and examining individual sectors separately. In so doing, the feedback of the loop (namely, the changes in the prices for the whole economy) was cut off.
9. Mr. Norgaard said that he had been concerned about that feedback loop for some time and that he was now using general equilibrium models, instead of partial equilibrium models so as to understand better what sustainable development meant. Many of the answers that were taken for granted using partial equilibrium analysis had been shown to be valid only within a limited context. General equilibrium analysis demonstrated how prices for the whole economy could change with alternative development paths. Such information could be used to formulate ways of influencing markets, and subsequently, the higher levels of social decision-making.
10. The speaker explained that sustainability was a matter that involved the rights of future generations and not the efficient use of resources. Efficiency was always desirable, but increasing efficiency could result in producing goods and commodities for the benefit of only a few, while sustainability was concerned with the well-being of many over the long-term. Sustainability thus involved a distributive problem. The concern of

economics to date, however, had been with efficiency (how to use resources efficiently over time), using Hotelling-type models. Those models, as currently used, assumed that current generations held the rights to resources and conserved resources only as long as those resources increased in value (meaning that the next generation was willing to pay more for them). The next generation did not however hold rights to resources in such models. He stressed that sustainability entailed future generations having at least the same resources as the current generation. Sustainability was thus a matter of assuring the rights of future generations to assets. It was not an efficiency question, but a distributive question. Viewed as a matter of intergenerational equity, like intragenerational equity, it was a separate issue from economic efficiency. An economy could be operating efficiently without necessarily being sustainable. Every intergenerational distribution of rights to resource use had an efficient allocation of resources within those rights.

11. Mr. Norgaard explained that different prices were generated by different economies depending on how those economies were operating. Such prices were only equilibrating mechanisms and did not contain an inherent understanding of value. Depending on what kind of an objective society was trying to reach, it was necessary to get the right values in the SNA so that the planners behaved correctly. And the right values depended on what the objectives were. If society was trying to achieve sustainability as an objective, then there should be a system that generated appropriate values and prices.
12. He explained that he had developed a model to look at the question of the optimal tax on greenhouse gases using an overlapping generations approach. By looking at how one generation cared for the next one, he had tried to model how different global societies would look at the question of reacting to climate change. The way society valued greenhouse gases depended on how it cared about the future. When society cared more about the future, it would emit less greenhouse gases and enact higher taxes on their emission. The interest rate controversy was resolved in the model. Environment and resource economists had for years been confronted by the dilemma that discounting future generations' benefits and costs did not seem to be consistent with sustainable development. Economists had suggested using a lower social rate of discounting in response to that apparent inconsistency. Using a lower discount rate, however, would make capital investment less expensive, resulting in the building of more dams and the drilling of more oilwells, and thus increased exploitation of the environment. In general equilibrium analysis, the discount rate decreased when



society cared more about the future. The decision to transfer more rights to future generations was made independently of discounting and the rate of interest would go down as a result of such a decision. By switching from a partial to a general equilibrium framework and considering valuation, one found that environmental issues were being accorded an even higher value. When those values were looked at in present terms, one found that society weighed them even more because a lower rate of discount was in use. Valuation was therefore higher than in a partial equilibrium framework.

13. The speaker stated that a lot of the theoretical tools used by economists, though they could have worked well in addressing problems of the 1970s and 1980s, might not be the best tools for addressing sustainable development. Sustainable development was an economy-wide issue referring not only to national economies but also to the global economy. Most of the tools so far had been sector-based and drawn from partial equilibrium models. Environmental and natural resource accountants needed therefore to start thinking of modeling whole economies when making adjustments to the SNA, instead of taking prices as they existed. First, they needed to imagine what the economy would be like if it were sustainable in order to determine the prices for adjustment. He added that environmental and natural resource economists needed to adjust not only the environmental side of the SNA, but also all the other parts of the accounts, since the SNA should be adjusted not only for environmental degradation and natural resource depletion, but also for the whole economy. If economies were sustainable, then people would behave differently, markets and economies would look different, and the SNA would look different. He added that implementing sustainable development programmes might lead to a different set of social, economic and environmental problems that would need to be addressed.
14. Mr. Norgaard concluded his presentation by highlighting a few of the main issues. The general equilibrium framework put emphasis on the transfer of assets rather than on efficiency which might have misled society in the past. He pointed out that new economic tools were now available to politicians and would enable them undertake major adjustments in the direction of long-term planning. He added that the political climate was ready for such adjustments and that there was now a consensus that society needed long-term planning.
15. Mr. Condos, Food and Agriculture Organization of the United Nations (FAO), opened the discussion on Mr. Norgaard's presentation by emphasizing the importance of efficiency as a goal under all and any system of preferenc-

es. He stated that preferences for future generations were reflected in the current generation's utility function. Research should focus on the increasing recognition of externalities through which concerns for future generations were revealed. Mr. Condos then asked how alternative population projection levels affected the way concerns for the future were incorporated in Mr. Norgaard's model?

16. Mr. Norgaard replied that economics interacted with politics. When society decided to assign new rights, then the economy operated differently. The key question was thus how could society come to the political consensus to protect the rights of future generations? In the political discourse on resource use, economists put forward an analysis based on arguments rooted in efficiency, where the efficient allocation was an outcome of the current distribution of rights. The economists' analysis assumed therefore that rights were not being redistributed, though the question was still how should rights be distributed? He emphasized again that the efficient outcome was a function of how rights were distributed. Regarding the question of how alternative population projection levels affected the way concerns for the future were incorporated in the model, he indicated that more work was needed on adapting the model to incorporate changes in the size of future population projections.

17. Mr. Mäler, Beijer Institute for Ecological Economics, stated that it was theoretically not possible to differentiate between efficiency and equity, as had been shown by Samuelson and others in the 1940s and 1950s. It was also not desirable to make such a distinction. In the early 1970s, economists had emphasized equity and they had had to look at capital accumulation to compensate future generations' welfare. Welfare sustainability was thus an equity issue and that had practical implications for national income accounting. Environmental and natural resource accountants needed to know the shadow prices in order to calculate sustainable income. It would then be possible to compute the national income in such a way that it measured sustainable income, that was the consumption that society could allow itself without reducing the consumption of future generations. Because perfect or complete property rights did not exist in the real world, the market interest rate would not take into account the productivity of assets not bought and sold in the market, with the profound implications the productivity of those assets would have on the interest rate. The market rate of interest could not therefore be used in discounting future welfare. It was thus necessary to look at the present and future productivity of ecological systems. He added that, if one assumed a complete set of

property rights and set of risk markets, the outcome would be optimum and sustainable and the interest rate would be determined in that model.

18. Mr. Friend, Institute for Research on Environment and Economy (IREE) agreed with Mr. Norgaard's thesis and indicated that the use of the interest rate created a problem. It was unfortunate that Faustmann, and then Hotelling in the 1930s, employed the interest rate (which was only appropriate for man-made investment) in their models of natural resource management which was further exacerbated by the single criterion of the "objective function" (i.e. optimizing financial returns). The concept of "discounting" created a lot of problems in the analysis on the evaluation of natural resources. Historically, economists viewed interest as a reward for thrift. He suggested that a better alternative was an objective function based on the value of foregone consumption, made up of an economic and an ethical component, the latter reflecting, *inter alia*, intergenerational equity.
19. Ms. Hecht, independent consultant, pointed out that Mr. Norgaard's thesis implied that current generations were imposing their preferences for current capital allocation on future generations. She also raised the question of how the approach could be used where prices were set by the market.
20. In response, Mr. Norgaard stated that the driving mechanism behind his approach was how society cared for future generations. He explained that that could be done through various measures such as the transfer of rights and modifying the social security system and not only through, for example, the setting of a tax on greenhouse gases.
21. Mr. Bartelmus, United Nations Statistical Office, highlighted the need to determine the boundaries for valuation. He also suggested that ethical issues, such as intergenerational distribution, did not need to be integrated into the monetary system. Since such ethical issues were based on individual preferences, they should be left to other methods of social evaluation which should set explicit targets to be valued through democratic processes.
22. In response, Mr. Norgaard stated that the process should be interactive across disciplinary borders. For example, when a tropical forest action plan with a set of objectives was drawn up, analysts should attempt to put those objectives into economic terms, to determine how the economy would work and if those objectives were met, what would be the resulting prices. Analysts should also try to determine what would be the impacts of

the various decisions on the economics of sustainable development, and model what the economy would then look like.

23. Mr. Awan, Islamic Development Bank, raised three points: firstly, could the problem of environmental degradation be viewed simply as one of equity? Since market prices did not reveal complete information, society was likely to be inside the production possibility frontier. Secondly, before intergenerational concerns were brought to the fore, especially for less developed countries, it was important to achieve some sort of intragenerational equity. Thirdly, Mr. Awan asked what was Mr. Norgaard's response to the memo of Mr. Summers of the World Bank concerning the relocation of polluting industries to developing countries.
24. In response to the first question, Mr. Norgaard stated that the problem could be conceived entirely as one of equity between generations. Regarding the second point, he agreed that intragenerational equity was very important for achieving intergenerational equity. To the third question, he replied that Mr. Summers' views were morally unacceptable.
25. Mr. Sheng, World Wide Fund for Nature (WWF) International, emphasized the possibility of using existing indicators of sustainable development to achieve intergenerational equity. Such indicators included the harvest of a renewable resource relative to its replacement or regrowth and the rate of exploitation of a non-renewable resource relative to the rate at which substitutes were found or developed.

### 3. *Methodology for the Calculation of Sustainable National Income*

26. Mr. Hueting, Central Bureau of Statistics of the Netherlands, presented his paper, *Methodology for the Calculation of Sustainable National Income*. He stated that there was no conflict between recording environmental losses in physical terms and relating those to the monetary accounts. Information on physical assets was needed to provide measurements in monetary terms. His methodology, which was the result of 25 years of research, was based on the concept introduced in the late 1960s of the environment as a provider of economic functions (goods and services) for humanity. In the early 1970s, he started research on correcting the national income for environmental losses, which required the evaluation of environmental functions and losses. Losses of environmental functions arose when the demand for one use (or function) of the environment reached a level, at which it impeded the supply of another use. At that level, competition developed between the two uses, resulting in a situation of scarcity. If one

function was sacrificed for another, those functions were regarded as economic goods.

27. Mr. Hueting pointed out that valuing in monetary terms the loss of environmental functions due to competition among different uses required the estimation of prices for those functions (known as shadow prices since they were not observed market prices). Estimating those shadow prices necessitated the construction of supply and demand curves for environmental functions. A supply curve for an environmental function could be based on the cost of measures needed for the restoration and preservation of the function, measured as a physical parameter (also known as elimination costs). Complete demand curves of environmental functions based on individual preferences could not be determined. It was therefore necessary to determine some standard for the availability of the environmental function. Such a standard could be regarded as a preference expressed by society for preserving environmental functions. In that case, the estimation approach assumed that individuals agreed with the prevailing standard. The standard could be one which was based on the sustainable use of the environment. He explained that his approach then consisted of calculating the cost of measures required to shift the level of economic activity to a sustainable level. Those costs consisted of four types: (1) costs of technical restoration measures; (2) costs of developing alternatives for depletable natural resources; (3) costs of the direct shift from environmentally-burdening to environmentally-friendly activities when technical measures were not enough to achieve the sustainability standard (for example, for the Netherlands, it was estimated that a shift of 1 per cent in the volume of labour from environmentally-burdening to less environmentally-burdening activities would have a negative effect on the volume of national income of 1.5 per cent); and (4) costs of reduction of the population and the resultant drop in the volume of activities when the first three types of cost led to an unacceptably low level of consumption per person.
28. The speaker observed, however, that it was impossible to calculate the correct shadow prices, based on individual preferences, for environmental functions and that therefore, true economic valuation of the environment was impossible. All valuations required assumptions regarding preferences for environment and sustainability which should be explicitly stated. For example, the approach taken by the World Resources Institute (WRI) placed a value of zero on the preferences for future generations. Mr. Hueting explained that, while sustainable development could not be defined, the sustainable use of the environment could be defined in statistical terms. He concluded his presentation by stating that his ongoing research focused on

how to translate the availability of environmental functions from physical terms into monetary terms.

29. Mr. Lone, Norwegian Ministry of Environment, opened the discussion on Mr. Hueting's presentation by pointing out that the environmental accounting methodology advocated by Mr. Hueting was not directly comparable to national income accounting. That was primarily because his approach estimated values and prices on a different basis than the market prices included in national income accounting. He stated that indirect costs of environmental damages, which were often much larger than direct costs, were not included, and added that, from a macro-perspective, the methodology did not incorporate potential savings arising from measures taken to restore an environmental function. He acknowledged that, although incorporating those savings into national income was difficult, the analysis in itself was very useful.
30. Mr. Hueting, in response, stated that, his approach was not meant to replace the national income nor to be integrated into the national accounts. The approach provided a comparison between the actual level of activity and the sustainable level of activity. In response to Mr. Lone's second point about the omission of potential savings, he added that that approach did not deal with modeling future costs and benefits, but attempted to describe the past statistically. He emphasized that his approach was concerned with translating physical assets into costs based on technical measures. He also stated that double counting and savings were taken care of in the approach.
31. Mr. Friend, noting that there was no conflict between physical data and monetary accounting, emphasized the desirability of a feedback between the development of physical databases and monetary values. That was important if economic values were to be sensitive to physical change in the state of the environment.
32. Mr. Condos asked how the information provided by Mr. Hueting's approach would be utilized in decision-making.
33. In response, Mr. Hueting stated that the main objective of the approach was to provide information for decision makers about the gap between the actual level of economic activity and a sustainable level of activity. He mentioned that consumption patterns in the West which included consuming large amounts of meat, heating the whole house, extensive use of vehicles, and consuming summer vegetables in winter, were overburdening the environment. If the pattern of consumption

changed or if there was a slower rate of population growth, national income would drop. That should not, however, give a wrong indication to the real growth of the economy.

#### 4. *Feasibility of Environmental and Resource Accounting in Developing Countries*

34. Mr. Friend presented his paper, *Feasibility of Environmental and Resource Accounting in Developing Countries*, in which he highlighted the relationship between ERA and the development process. If one considered the information needs for the planning process within the context of sustainable development, the key question was whether the information base currently being used was out of phase with that required for sustainable development. He divided information needs in developing countries into three areas: information for formulating development plans; information for monitoring the development process and implementation of development plans; and information for evaluating the results of development plans to determine if objectives were met. One issue concerning evaluation was whether the current measure of national income was the most appropriate for evaluating the development process.
35. Mr. Friend pointed out that work on ERA had been undertaken in many developing countries, including Botswana, China, Costa Rica, Indonesia, and the Philippines, but that the approaches applied had been different. Various organizations, such as the UN Statistical Office and the Economic Commission for Europe (ECE), were also working to develop the meta-language of concepts, classifications and measurements for ERA. More work was, however, still needed in other organizations, such as UNEP and the regional economic commissions, to develop particular concepts and methods appropriate to different regions. The UN Statistical Office now had a series of reports on environmental statistics based on a common framework, the Framework for the Development of Environment Statistics (FDES). The structure was stress-response linking human activities with physical changes, which was crucial for the integration of socioeconomic and physical database.
36. Mr. Friend's experience with developing countries suggested that there was a large gap between the collection of physical data and the socioeconomic surveys of statistical offices. He explained that natural resource ministries produced data for narrowly defined client specifications, whereas statistical agencies were concerned about national assessments. Informa-

tion on the state of the environment was often incidental to data collected for other purposes. Thus the need for coordination of data gathering among government departments like the statistical agencies, ministry of natural resources, environment, agriculture, mapping agencies and so forth. He emphasized that specific information needs had to be identified for the coordination of data collection efforts. Large sums of money were allocated to natural resources data collection, (in Canada approximately \$500 million per year to collect physical data, which was twice the amount spent to collect socioeconomic data). A similar kind of situation with respect to the allocation of funds probably existed in the Third World.

37. Mr. Friend concluded his presentation by stating that there was great difficulty in securing funding from overseas development assistance for ERA work in developing countries. That fact reflected a gap between the rhetoric on sustainable development and the recognition of the information bases necessary to achieve it.
38. Mr. Condos opened the discussion on Mr. Friend's presentation by questioning how expenditure on the collection of data, the use of which was not very clear, was justified.
39. Mr. Friend replied that statistics offices did not usually know how the data they collected was used until they stopped producing it. Questions had always been asked about who wanted environmental information, but when Canada produced the State of the Environment report, it was widely welcomed by the public. Discussions should not be over-concerned about justification from a more bang-for-the-buck standpoint, but rather over questions of scientific validity, relevance for social policies, and appropriate frameworks for integration. So far most of the work in ERA was concerned about framework development. One should recall that when the first measures of Gross National Product (GNP) came out in the 1940s it was hardly noticed and it took many years to seep into the public conscience as an indicator of economic performance. Changing the frame of reference for analysis was a slow and arduous process, but ultimately led to revolutionary shifts in peoples' perception of how-the-world-works.
40. Mr. Condos, commenting on Mr. Friend's response, stated that the SNA of the UN type came about seven years after the publication of the econometric work of Tinbergen, while monetary and fiscal policy used today had been in place for at least two centuries. One of the difficulties with accounting exercises was that they were far from indicating their policy uses.



41. In response to Mr. Condos, Mr. Friend pointed out that the Department of Finance in Canada claimed it needed the national accounts for fine-tuning the economy. He mentioned that there were three types of framework involved in ERA: natural resource accounting, environmental statistical systems (sometimes referred to as state of the environment reporting), and environmental accounting in the SNA. Most of the funds in statistics were spent on the collection and compilation of data, while the development of statistical frameworks and the research on the underlying science, values and ethics are relatively cheap.
42. Mr. Norgaard noted that most of the information society possessed was about parts of systems, while environmental issues concerned the interactions between those parts. Society could shift environmental interactions in various ways depending on what kind of economy it wanted to have in the future. Western science was very ill-developed in the conception of systems and therefore faced a problem in attempting to define sustainable development. How data was integrated depended on society's goals. However, no single aggregation of data seemed to answer all of society's questions. If environmental and natural resource accountants were required to find the framework appropriate for all applications, society would be in trouble. Even multiple frameworks could result in a lack of appropriate information. Mr. Norgaard, however, emphasized the need to accelerate the integration of data which might imply the need for multiple frameworks.
43. Mr. Hueting stressed that differences between ERA approaches were based on the differing assumptions that underlay the calculations. It was therefore important to make those assumptions explicit. Though he appreciated the work undertaken by WRI in Indonesia, the study would have had a much greater information value if the underlying assumptions regarding the preferences for environment and sustainability would have been mentioned explicitly.
44. Mr. Friend pointed out that the WRI study was an example of how the availability of data determined the assumptions made. The WRI used an approach which was simpler than alternatives, based on better frameworks because of the relative lack of readily available and appropriate data. In some ways, the study was successful, since it drew the attention of people to the cost of resource depletion. The WRI study was thus a valuable exercise, but a more sophisticated approach would have been preferred, had the necessary data been available.

45. Mr. Bartelmus emphasized the importance of linking physical databases with socioeconomic databases, as was being done within the framework of the SNA and as Mr. Friend had noted in his presentation.
46. Mr. Sheng emphasized the need to find ways to utilize existing information for the implementation of resource accounting, while Mr. Potier of the Organisation for Economic Cooperation and Development (OECD) underlined the need to generate pertinent information rather than any kind of data.
47. In response to a question from Mr. Abaza, UNEP, regarding the reason for the lack of funding for ERA work in developing countries, Mr. Friend indicated that the lack of support for activities in that area could be attributed mainly to the fact that donors did not consider the subject sufficiently attractive for funding. Another reason was their concern regarding frameworks that had not yet been sufficiently articulated or concretely demonstrated.
48. Mr. Friend then summed up the main points which had arisen in the course of his presentation. Regarding the use of data, he emphasized the importance of dialogue. In most cases, statistical offices did not know who the data users were until the information was produced and available for use. Secondly, he stressed that ERA was linked to policy and the development process. While developed countries, which already had environmental policies in place, could have excellent environmental policies without ERA, developing countries could not have such policies without good information about the actual state of the environment. In developing countries there was a stronger connection between how information drove policy rather than the other way around.
49. Mr. Norgaard summarized the discussion on Mr. Friend's paper by highlighting the trade-off between an over-abundance of data, which did not seem to be aggregated at a level of use for many people (unlike the SNA), and the aggregation of the data to make it more usable, which could exclude some information and some uses of the data. The designers of the SNA could not foresee the advantages and disadvantages of the system. Environmental and natural resource accountants should move ahead with alternative options (multiple frameworks) so that society would not get locked into a system which later turned out to be incorrect.

## 5. *System of Integrated Environmental and Economic Accounting (SEEA)*

50. Mr. Bartelmus gave a presentation on the System of Integrated Environmental and Economic Accounting (SEEA) being developed by the UN Statistical Office. He mentioned that discussion on integrated environmental accounting had been initiated by UNEP and the World Bank through the convening of a number of workshops in the early 1980s. After the definition and development of concepts, discussions had concentrated on how to incorporate those concepts into the existing SNA. With the help of expert group meetings, the most recent being held in Baden, Austria, regional seminars and country projects, the Statistical Office developed a SEEA which was elaborated in a handbook. The SEEA attempted to amalgamate and integrate the different approaches in natural resource and environmental accounting in a module presentation. The interim, or provisional, version of the SEEA Handbook, which was expected to be published in 1992, would provide alternative options in areas where there was no consensus. The Handbook had been submitted to the Preparatory Committee of UNCED at its fourth meeting and a revised version was to be made available to the Conference. Integrated accounting and the underlying data requirements had been included in the draft Agenda 21 to be adopted by UNCED. A funding estimate of \$2 million was proposed by the UNCED Secretariat for the implementation of integrated environmental and economic accounting. Although the Handbook, as a technical report, would be non-binding, it would still have an inherent standardizing effect. Despite initial reluctance, national accounts experts had now relented, to a certain extent, to the incorporation of environmental considerations into the SNA. For example, the guidelines on asset balance sheets now incorporated natural resource balances, though in a manner different from the SEEA, and those guidelines would be integrated into the ongoing revision of the SNA. The revised SNA would thus incorporate all natural resources having an economic value, but in less detail than the SEEA and outside the income/production accounts as "other volume changes" of natural assets.

51. Mr. Bartelmus highlighted the five major objectives of the SEEA: the first objective was the segregation of environmental information using a conservative approach to identify environmental protection expenditures (by appropriate classification). Although a controversial issue, segregation permitted the modeling of "defensive expenditures" and produced information on the amount of funding a country was willing to spend on the environment and in what areas. The second objective was to provide a data framework for linking physical resource accounting with monetary environmental accounting. The third objective was the assessment of environmen-

tal costs and benefits by trying to value natural resource depletion and pollution (emissions). The SEEA applied different costing approaches to those issues via market valuation, maintenance cost valuation and contingent valuation, of which the latter two were not fully consistent with other market valuations. Maintenance cost was required to assess changes in environmental quality which was more controversial than the valuation of natural resource depletion (for which market values were the basis for estimation). The fourth objective was accounting for the maintenance of tangible wealth by extending the concept of capital to cover not only man-made capital, but also natural capital. The fifth objective was the calculation of environmentally-adjusted indicators. He explained that resource depletion was calculated with a number of methods similar to capital depreciation and accounted for as depreciation to be deducted from NDP to obtain an environmentally-adjusted net domestic product (EDP) which took depletion and degradation of natural resources into account.

52. Mr. Bartelmus pointed out that the SEEA was a conservative system. It tried to integrate environmental activities closely related to the economic system, but health, ethical and aesthetic issues were not incorporated in the system. The SEEA aimed to incorporate that part of the environment which came within the economic boundary and did not account for changes occurring only within the natural environment. The SEEA was thus different from the approach being developed by the EEC, which was based on the French system.

53. He reported that, at the 1991 Special International Association for Research in Income and Wealth (IARIW) Session on Environmental Accounting in Baden, Austria, one significant concern had been the need to separate resource depletion from environmental degradation in the framework. For that reason, the SEEA had calculated two measures of Environmentally-Adjusted Net Domestic Product,  $EDP_1$  and  $EDP_2$ , the first with adjustments for resource depletion and the second with adjustments for environmental degradation. Two valuation methods for the maintenance of natural capital as a production factor were proposed in the SEEA. The first was the net price method, which had been developed and applied by WRI in Indonesia and Costa Rica and which measured the net reduction in a natural resource beyond regenerative capacity, net of all costs including an allocation of normal profit. The second was the user cost allowance proposed by El Serafy of the World Bank, which was based on the concept of investing a portion of the income received from the depletion of an asset in order to generate a permanent stream of income. Both methods appeared to start from the same concept of capital depreciation, which represented the

difference or change of income-generating capacity of capital for the future. The WRI approach discarded future income streams, which would have needed to be discounted, by deducting current "net rent" only. He indicated that the WRI approach could be justified by using two arguments: firstly, price increases and changes in the value of relative prices, capital and income due to price changes could be interpreted as items that should be considered as revaluation outside the income and production accounts. Secondly, the discount rate and resource scarcity increased at the same rate. The WRI approach was a straightforward valuation that could be linked directly to physical changes in the natural capital. El Serafy's basic assumptions were the possibility of reinvesting the income earned from resource exploitation, and a constant flow of income over time, which could both be questioned. The SEEA valued changes in environmental quality by estimating the costs of restoring or avoiding environmental quality changes (restoration or avoidance costs). Restoration costs attempted to show how much it would cost to return the level of environmental quality to what it was at the beginning of the accounting period. Those costs depended on many variables and sometimes complete restoration was impossible as the required technology was not available. On the other hand, setting standards, unlike market prices, did not reflect individual preferences.

54. Mr. Bartelmus indicated that the SEEA had been criticized on the grounds of inconsistencies with the SNA (market) valuation. He agreed that those inconsistencies may indeed render the interpretation of national aggregates doubtful despite the fact that they were still attractive to decision makers. Mr. Bartelmus acknowledged that there were also limitations to valuation techniques. The SEEA aimed, however, at allocating environmental costs to different sectors of the economy. Even if those costs were not fully consistent with market valuation, the approach constituted a first step towards assessing those costs and thus internalizing them into micro-economic decisions. The experience of the OECD proved that market mechanisms for internalizing environmental costs raised funds, but that those funds were far from being equal to the actual damage created. The mechanisms were therefore a long way from achieving "the polluter pays" principle. Those cost estimates represented thus an initial attempt to show decision makers the impact of economic activities, in monetary terms, on the basis of which they could introduce the necessary measures and regulations such as taxes.
55. Valuation in the SEEA was limited to immediate damages linked to economic activities, and valuation of further environmental damages to the human health of the ecosystem was not addressed. Regarding the choice

of options in development plans, the SEEA did not provide an indicator of sustainable development since that included other considerations such as health or equity. Rather, the SEEA calculated an indicator of sustainable economic growth in the sense of the sustainable use of the natural resource base. Models using input-output methodologies and linking those to environmental standards and accounts could show feasible and alternative development options, as had been done with simulation and activity analysis models.

56. With respect to Dr. Tolba's question on whether there should be tailor-made or standardized methodologies, Mr. Bartelmus indicated that there were various approaches to ERA, but that the SEEA sought to provide a standardized framework. He cited the experience of Indonesia, where a number of actors, including WRI, Peskin, were involved in producing different approaches. In addition, Norway had also introduced its approach to Indonesia and the UN Statistical Office had been approached by the Statistical Office of Indonesia. He also mentioned the example of Malaysia, which had been approached by the World Bank, but refused to introduce ERA due to the variety of approaches being proposed.
57. In concluding his presentation on the SEEA, Mr. Bartelmus emphasized the need for more field experience and application. That should be followed by further consultations and revisions, based on the country-specific experience, to attempt to incorporate the various views. To produce more than an interim version of the Handbook, more country studies were required (two or three were not enough), including country projects for those requiring assistance in using existing methodologies. An assessment should then be made by international organizations and experts in the field so that the approach could be revised and guidelines, rather than a technical report, could be produced. He finally stated that replacing the established system of national accounts was not necessary. There was a general consensus that environmental accounts could be parallel "Satellite" systems, which could be used for alternative purposes, e.g. long-term versus short-term economic analysis.
58. Mr. Hueting opened the discussion on Mr. Bartelmus' presentation by pointing out that the SNA and SEEA focused on production activities, not the issue of economic scarcity. He indicated that shadow prices for environmental functions, directly comparable with market prices, were required for correcting the national accounts. It was, however, impossible to arrive at such shadow prices since it was impossible to get a complete demand curve. Every approach to express the environment in monetary terms was

therefore based on assumptions regarding the preferences for current and future availability of environmental functions. The WRI approach made an assumption about preferences for environmental functions which amounted to no preference for the future. He emphasized that the question was not of different methods but of different assumptions regarding environment and sustainability. He added that he could not accept the idea that society had to increase production to save the environment.

59. In response, Mr. Bartelmus explained that the SEEA, as an accounting system, used available information. He stated that an accounting system should not go into the modeling of shadow prices. It should report information which could be easily interpreted. The SEEA thus aimed at applying market-based valuations. He indicated that one purpose of the SEEA was to extend the coverage of capital in the SNA to include natural capital further. Impact on human welfare was excluded, since it was difficult to measure. With respect to future income streams, he stated that, while the WRI approach left out discounted future income streams, the El Serafy method included considerations for future income generation. The maintenance cost approach used in SEEA was similar to Mr. Hueting's, both of which measured the costs of environmental expenditure and technological solutions. The only difference was that the SEEA tried to link the costs to the national accounting system, while Mr. Hueting's approach did not. Information provided in SEEA could therefore be used for the application of sectoral production and investment policies to operationalize "the polluter pays" and "user pays" principles. Governments would then have a starting point to assess the level of market instruments to be applied for the internalization of environmental costs.

60. Mr. Mäler stated that the valuation of changes in environmental assets had been improved and would continue to be improved, given the current rapid achievements in valuation methodologies. Although it would never be possible to arrive at a complete set of valuations for environmental resources, it was nonetheless possible to achieve improvements in the accounting system. Valuations, as distinct from estimating the costs of providing environmental functions, should be undertaken since the valuation exercise was not necessarily more complicated than the costing exercise. In addition, the elimination cost could be very low in relation to the consequences of the original action. Valuing those consequences with the cost of undoing the action could therefore be misleading. He stated that the WRI approach was the truly correct one if the correct shadow prices for the resources were used. Future generations could thus be taken into account by valuing the extraction with the correct shadow prices, but there was no

indication in the Indonesian study that the shadow prices had been selected in the correct way.

61. In response, Mr. Bartelmus stressed that the SEEA used the avoidance and restoration cost approaches for costing environmental degradation, not the damage cost approach. That issue would be raised in the Handbook, which would facilitate the possible calculation of a "green income" closer to an indicator of welfare and in the valuation of consequential damage costs.
62. Mr. Friend noted that there appeared to be some confusion among the three concepts of integrated environmental-economic accounting, physical resource accounting of stocks and flows, and state of the environment (SOE) reporting. He emphasized the need to distinguish between those three frameworks. With respect to the quality of the environment, he stated that there was considerable interest in SOE reporting in measuring the state of the environment from an ecosystem point of view. The question of ecosystem integrity, in particular, was slowly emerging as a policy issue. The major concern was whether an ecosystem was being maintained in a healthy and productive manner. SOE reporting thus provided an opportunity to assess socioeconomic activity from an ecocentric viewpoint as opposed to the anthropocentric viewpoint of economic assessments. SOE reporting concerned the reorganization of the collection and analysis of information so that statements could be made about the changes in the integrity of ecosystems. He stated that the Malaysian Government was probably afraid that ERA would produce the same results as the Indonesian case study and had therefore refused assistance in that area. If physical resource accounts had been proposed, the Government would most likely have accepted.
63. Mr. Bartelmus argued that environment statistics should take an anthropocentric view in linking standard statistics in the socioeconomic fields with the physical environmental indicators. That linkage should be done as a counterpart to the monetary system. He added that the Handbook would thus give equal weight to monetary and physical data and possibly even more to the latter.
64. Mr. Norgaard stated that ecologists were going beyond the consideration of keystone species and individual phenomena in formulating what ecosystem integrity or health meant. Ecologists found it necessary to develop their understanding of ecosystems at a broader level. In the United States of America, an ecosystem valuation forum, composed of ecologists and economists including himself, was addressing the question of ecosystem health. In addition, the United States Environmental Protection Agency



(EPA) was trying to devise ways of assembling data in larger units in order to develop the understanding of ecosystems at a macro level. Those represented attempts by biological scientists to develop indicators of ecosystem health, integrity and vulnerability at a higher level than had been dealt with before.

65. Mr. Lone pointed out that the calculation of net national product always involved some assumptions. ERA approaches should use valuation and accounting methods which were closer to market-based approaches when focusing on natural assets that were traded in markets. Another problem with the calculations involving capital and its depreciation was that they were based on assumptions about future technology and price trends. It was therefore not possible to calculate NNP and NDP by using only actual realized transactions, as had been discussed and agreed upon at the Baden meeting. Calculating the traditional national income figures thus meant invoking some assumptions. He expressed his satisfaction with the SEEA because of its closeness to the market-based foundation of national accounting in not considering environmental qualities outside the market. The SEEA confined itself to natural resource stocks which provided goods that were exchanged in the market. Mr. Lone also stated that macro-economic modeling incorporating relative price changes, and not just fixed coefficients, should be undertaken. The United Nations, with Norwegian support, was working on a new version of the Leontief model, originally constructed mostly with fixed coefficients which were of limited usefulness. That model had to be supplemented, as in Norway, with macro-economic models of the short-term type and global equilibrium long-term type, and it could be linked to physical accounts for modeling purposes.
66. Mr. Hueting stated that, since the increase in national income was until now accompanied by the destruction of essential economic goods provided by the environment, he objected to the notion of measuring sustainable economic growth, as proposed by the SEEA.
67. In response, Mr. Bartelmus stated that the SEEA made no assumptions about the feasibility of achieving sustainable economic growth. The accounting system would show whether growth, as conventionally measured, had been sustainable or not. He added that the system measured the sustainability of economic growth in terms of produced and natural capital used in production and if national product was taken as the key indicator of growth.

68. Mr. Friend stated that, although the collection and analysis of data continued, a shift in paradigms or how society viewed the world was also taking place. Such a shift required environmental and natural resource accountants, for example, to go through a long, evolutionary process in devising ERA approaches. That was part of eliminating some of the traditional ways of looking at the world. He cited the example of the cleaning up of the Great Lakes of North America. The concept of the ecosystem approach had been integrated into the regulations of the Great Lakes water quality agreement signed by Canada and the United States of America. The confusion had begun when the relevant Governmental authorities had started to think about what such an approach meant. What became evident was the link between environmental protection and conservation policies and the implementation of fundamental principles required to maintain healthy ecosystems. In other words the recognition that a mal-functioning ecology was a mal-functioning economy.

69. In summarizing the discussion on Mr. Bartelmus' presentation, Mr. Norgaard indicated that the SEEA attempted to integrate various approaches to, and concerns about, ERA. He added that the SEEA was reaching an operational level with a certain degree of flexibility.

**6. *Application of the System of Integrated Environmental and Economic Accounting (SEEA) in Papua New Guinea and Mexico***

70. Mr. Bartelmus presented the results of testing the SEEA methodology in Papua New Guinea (PNG) and in Mexico. He stated that the World Bank was still in the process of clearing the PNG study which would soon be published. He could not therefore release the figures of the case study. The main purpose of the PNG study was to test the methodologies rather than to attempt to give an accurate assessment of the trends regarding key modified economic indicators in PNG. Three experts had visited the country for two and a half weeks collecting information available in various ministries and other Governmental and non-governmental institutions and then processed that information without further involvement of the Government. The study did thus not attempt to institutionalize the SEEA within the Government. He emphasized that, in the future, country studies would aim at institutionalizing the process of constructing integrated accounts within the relevant government agencies.

71. Mr. Bartelmus stated that the main purpose of the Mexico study had been to improve the information available on environment-economy linkages

and to process that information for policy uses. The approach used in Mexico was different because the study had been carried out by Government counterparts, whose participation had been financed by UNDP. The study had also involved a substantial amount of data collection. The Statistical Office intended to follow up and improve on the studies undertaken in both PNG and Mexico with respect to both data and policy application.

72. He stated that the first step in the studies had been to identify the main environmental problems and concerns and the capabilities of countries to carry out such studies. The PNG study had endeavoured to cover all the environmental concerns which could be identified. In contrast, the Mexico study had omitted certain areas, either because they were too complex or because the relevant databases were too difficult to synthesize. Omitted areas included biological diversity, loss of species, genetic resources, ecosystem health and stability, marine environment, fish resources and historical monuments.
73. Mr. Bartelmus reported that the Statistical Office was now exploring the feasibility of a similar study in Thailand. An exploratory mission had already examined some of the problems of feasibility and data availability and had identified three environmental issues: encroachment on forests as a result of agricultural activity (as opposed to commercial logging activities), congestion, and urban air and water pollution.
74. He summarized the results of the Mexico and PNG studies and highlighted the differences that the results revealed between the two aggregate measures,  $EDP_1$  and  $EDP_2$ . In Mexico,  $EDP_1$ , which included natural resource depletion but excluded environmental degradation, was about 94 per cent of NDP.  $EDP_2$  had been calculated by further deducting the cost of degradation in the form of air pollution, soil erosion and deforestation (contrary to the PNG study which had considered deforestation as resource depletion), and was estimated to be about 87 per cent of NDP.
75. He explained that the two studies used different concepts of net capital accumulation. In the Mexico study, the net accumulation resulting from increases and decreases in the stock of natural resources had been calculated and compared to the modified aggregates of  $EDP_1$  and  $EDP_2$ . In contrast, the PNG study had excluded natural growth and discovery of natural resources in accordance with the conventional production and income accounts. The PNG study registered the positive amounts (increases) due to natural regrowth, discoveries, and negative effects of natural

disasters as "other volume changes" (which were formerly in the reconciliation accounts). Those increases were considered as non-economic elements outside production and income generation. He indicated that accountants disagreed about which approach to use.

76. Mr. Bartelmus pointed out that, in the Mexico study, net capital accumulation was 6 per cent of  $EDP_1$ , as compared to 11 per cent of NDP. When environmental quality was included, net capital accumulation fell sharply to -2 per cent of  $EDP_2$ . That figure resulted from two movements: the transfer of environmental capital to the economic system (increase in economic assets of 13 per cent of  $EDP_2$ ), and a decrease in environmental capital corresponding to quality degradation (-15 per cent of  $EDP_2$ ). He stated that, in addition, time series were developed for the PNG study.
77. He identified the methodological difficulties in valuation that had confronted both studies. The user cost allowance and the net rent method revealed very different results in the valuation of resource depletion in both countries. In comparing the results of the two country studies, he noted that, in the PNG study, the user cost allowance method produced a value which was about half the value of the net price method. The difference depended on the various assumptions used. In Mexico, the ratio of the values produced by the two methods had been different, with the user cost allowance yielding a relatively much lower result. The net rent of oil extracted was calculated to be 1,200 pesos/barrel, while the user cost allowance method had produced a value of 160 pesos/barrel. In the case of timber, the net rent had been calculated at 22 pesos/m<sup>3</sup>, while the user cost allowance had produced a value of 1.5 pesos/m<sup>3</sup>. The differences in the values produced by the two methods resulted from differences in the life expectancies, deposits, reserves and the rates of exploitation of the natural resources in the two countries.
78. He stated that, regarding the valuation of environmental quality degradation (pollution from various economic activities, improper practices, especially in agriculture and recreational activities), both studies used avoidance and restoration cost approaches. While those two approaches were the only ones used in the Mexico study, the PNG study had applied a number of approaches and had then taken the least cost approach for further application. For forest-clearing activities, the PNG study had used a valuation method based on the compensation of local populations (those who owned the natural resources). Compensation was observed in actual negotiations between local populations and logging or mining companies. The observed amounts had been adjusted using the opinions of various

actors on the appropriateness of the amounts. A good argument could be made for re-introducing traditional property rights for those who were closest to the natural environment as they could well be the best managers of those resources. In cases where those negotiated figures were not obtainable, the study had used the avoidance and restoration costs.

79. Mr. Bartelmus stated that the Mexico study did not clearly separate the ecological and economic functions of forests. The study applied the net price method for timber exploitation and a tree loss approach to represent the ecological value of the resource, calling it transfer losses (losses/transfer of forests to the economic system). For each resource, the PNG study tried to distinguish between the natural resource, as defined for EDP<sub>1</sub> purposes, and any further ecological effect. In the case of forests, only the timber value was relevant for calculating natural capital depreciation since environmental degradation costs were assessed separately in physical terms through emission measurements and, in monetary terms, through the various approaches mentioned above. He emphasized that it was necessary to distinguish between elements of natural resource depletion and environmental quality degradation.
80. He stated that the encroachment on forests in Thailand posed an interesting problem. The question was if such encroachment, which was largely responsible for land loss through erosion and degradation, was an economic issue and should be reflected as a loss of natural capital for agriculture or if that loss should be treated initially as a loss of forests and ecological functions, and that the consequential effects leading to erosion should be calculated separately. Nevertheless, in both cases the losses would be allocated to agriculture, but EDP<sub>1</sub> would be influenced in one case and EDP<sub>2</sub>, in the other.
81. The speaker pointed out that discussions were continuing on how to adjust the SNA in the current revision. For that reason, the Handbook would be an interim version. Approval of the revised SNA by the UN Statistical Commission, the Economic and Social Council (ECOSOC) and the General Assembly would provide incentives for the revision of the SEEA methodology to make it consistent with the conventional accounts.
82. He indicated that access to the data sources was the key problem in both of the studies. Although data existed, it was often dispersed, fragmented, and difficult to generalize and synthesize. He also summarized the four main recommendations of the PNG study for policy-makers which all related to the improvement of databases. The first was that natural

resource accounts should be established for fish stocks, soils, subsoil assets and forests. Comprehensive land use statistics should support those accounts and link them closely to various socioeconomic activities. The second was that the Government should initiate selective monitoring of effluents and loading of water pollutants from mining, agriculture, industry, and municipalities. The third was that the Government should collect data on changes in biological diversity. The fourth was that expenditures by households, various Government departments and industry on environmental protection should be identified and segregated. The study had not succeeded in doing that because the national accounts did not have provisions or appropriate classifications to identify those expenditures separately.

83. Mr. Bartelmus, in concluding his presentation, stated that the Statistical Office intended to publish a second volume of the SEEA Handbook. The second volume would make recommendations on various practical issues including data availability, periodicity and processing for integrated accounting, how to bridge the gaps between environment statistics, physical resource accounting, and integrated environmental-economic accounting, and illustrations of the estimation procedures. With respect to recommendations on the periodicity of data, he envisaged a period of between five and ten years for the collection of benchmark data, but key indicators should be collected in the interim permitting the extrapolation of the accounts on an annual basis.
84. Regarding the relationship between the SEEA and the SNA, and the structure of developing countries' economies, Mr. Friend pointed out that the SNA was inappropriate for developing countries. The SNA had been developed in industrialized countries as a result of concerns in the 1930s relating to the economic depression. The SNA was thus designed to deal with fluctuations in trade cycles rather than with long-term changes in economic structures. Linking the SEEA to the SNA in developing countries, where there was a huge informal economy, also presented a problem. Much of people's welfare in developing countries was related not to the market, but rather to access to natural resources. As the quality of those resources became degraded, the quality of life of the population also degenerated. That was not reflected in the national accounts. The SNA therefore, neither fully incorporated the environmentally dependent informal sector nor the rate of depletion of natural resources, which were important factors in assessing economic development. Because of that omission, the Mexico and PNG case studies probably underestimated the effect of environmental degradation on economic well being. Economists need to rethink the production/consum-

ption boundaries of the SNA in order to provide a more realistic assessment of social development. Casual observations in poor countries show a strong connection between environmental degradation and the decline in living conditions.

85. Mr. Bartelmus agreed with Mr. Friend's comment and stated that the inclusion of the natural resource base and the informal sector in conventional accounts was being considered in the revision of the SNA. There was a good chance that the natural resource base would be included in the revised SNA. But, as far as the informal economy was concerned, he did not have up-to-date information on what was happening, although the revised SNA would probably include some estimates on the informal economy. He further stated that the Statistical Office was working within the constraints and limitations of the SNA. He had therefore been making a case for linking physical resource accounts with environment statistics within the framework for the Development of Environmental Statistics (FDES) developed by the Statistical Office. Only then could physical data be integrated in the framework of resource accounts, and ultimately, national accounts.
86. Mr. Huetting pointed out that the use of the word "valuation" in the Mexico and PNG studies was misleading. It gave the impression that the value of lost resources had been calculated which was not the case because the demand was unknown. He emphasized that the net rent method for estimating future income streams of natural resources implied practically no preference at all for future generations. He stated that the use of the interest rate in that connection was inappropriate. Interest was a tool for allocating resources within the current generation and a means of remuneration for income foregone with the expectation of getting a higher income in the near future. Economists were now using the interest rate as an intergenerational distribution tool, which it was not. How society distributed resources between generations depended on its preferences for the living conditions of generations to come. If that preference was high, then the discount rate was low or zero. He emphasized, however, that those preferences could not be quantified. If humanity were to use resources in a sustainable manner, then the current generation should not use more of a resource than had become available through regeneration or through substitutes which could fulfil the functions of the resource. The cost of achieving sustainability could be calculated without any underestimation by calculating the cost of measures to leave the resource base intact, inter alia methods to improve efficiency and recycling methods.

87. Mr. Bartelmus disagreed with the previous speaker. He stated that the case studies, using certain assumptions, employed methodologies for placing monetary values on depletion of natural capital used in production similar to estimating the depreciation of produced capital. The loss of further ecological function of natural assets was estimated additionally similar to Hueting's approach in terms of maintenance costs. He added that those methodologies would be further tested in various studies.

88. Mr. Norgaard summarized the discussion of Mr. Bartelmus' presentation of the case studies by pointing out that Workshop participants had different opinions with respect to the amount of information available, the underlying theory behind accounting and valuation, and what the aims of environmental accounting should be. Participants appeared to be divided between two general strategies for ERA. The first was to modify the SNA using existing prices based on how economies were operating today and the second was to determine the prices that would be generated by sustainable economies and then compare the current economy with the hypothetical one. The first strategy resembled what had been done in the past, but, in the second case, the economist assumed the social goal of sustainability and then provided information that compared the hypothetical with the current economy. He pointed out that the Workshop would probably not resolve that key difference. An information system that permitted either type of calculation would be preferable. In that way, accountants and society were not limited to data processed for the first approach, thereby disallowing the second approach, or vice-versa.

7. *Second Meeting of the Intergovernmental Working Group on the Advancement of Environment Statistics*

89. Ms. Shah, United Nations Statistical Office, reported on the outcome of the second meeting of the Intergovernmental Working Group on the Advancement of Environment Statistics, which had taken place in Arusha, Tanzania, the previous week.

90. Ms. Shah said that the UN Statistical Commission had proposed the creation of the Working Group at its twenty-fifth session in 1989. At that session, the Commission had recommended that a group of specialists from interested countries should be established to assist the Statistical Office in the development and implementation of the environment statistics programme.



91. She stated that the first meeting of the Working Group had been held in Oslo, Norway, in 1990. At that meeting, the Group had examined the current status of methodologies for environment statistics. The Working Group had decided that emphasis should be placed on statistics in selected areas of high priority, including air pollution and energy use, water use and quality, and environment-related agricultural statistics. The first meeting had taken an innovative approach, whereby pairs of countries, one developed and the other developing, would work together on those priority areas.
92. Ms. Shah explained that the second meeting, held the previous week, had discussed the progress made by those country pairs. The Working Group had achieved partial success in that Norway and Mexico had developed a draft report on air pollution and energy use, while the other drafts were still being prepared. The purpose of the reports was to test the adaptability of ECE classifications for environment statistics to the conditions and capabilities of developing countries and to expand those methodologies to include the following subject areas: air, water, land and human settlements.
93. Ms. Shah pointed out that, parallel to that process, the Statistical Office had published a technical report on *Concepts and Methods of Environment Statistics: Statistics of the Natural Environment*, based on the *Framework for the Development of Environment Statistics*. That report as well as its companion report on human settlements statistics presented lists of statistical variables that could be selected in the development of national and international programmes of environment statistics. Comments received on the reports suggested that the volume of statistics was extensive and proposed that they be condensed into key "environmental indicators". The latest meeting had discussed a set of about 100 such indicators, which were still considered to be too large in number. The meeting had therefore suggested that the number of indicators should be limited to 15 or 25. The meeting had also decided that countries would produce position papers for the next meeting to take place in Wiesbaden, Germany, in December 1992, describing their need for and experiences in the compilation of environmental indicators.
94. Ms. Shah indicated that the meeting had also decided to develop a glossary of terms of environment statistics, to prepare an inventory of training facilities in environment statistics, to establish a network of environmental statisticians, and to conduct a survey of country practices in environment statistics. The meeting had emphasized the need to link environmental accounting to environment statistics since physical statistics

were a prerequisite for environmental accounting. Regarding international data compilation and dissemination, she stated that, the Statistical Office did not expect to embark upon that until enough regional and national programmes on environment statistics had been established. The Statistical Office intended, however, to include in the next edition of the UN Statistical Yearbook, selected series of environmental data from various international sources such as UNEP, WHO, or FAO.

95. Mr. Friend opened the discussion on Ms. Shah's presentation by expressing concern about the recommendation of the second meeting with respect to categorizing environmental information by subject areas such as air, water and land. That approach appeared to be breaking away from the integrated approach to environmental issues which had been agreed upon earlier. Statisticians needed to recognize that the environment and the economy were closely interrelated. They should develop databases on the basis of the dynamic real world model and not on an arbitrary set of subject areas.
96. Mr. Bartelmus, in agreeing with Mr. Friend's comments, observed that environment was still widely considered a specialized area. He added that many people wanted a reduction in the information load, but did not know how the information would be used. He pointed out that aggregate indicators should be used for those who could not deal with large masses of information, but as in the social indicator movement, which was largely a failure, the selection of indicators was a very subjective process. There was a gap between the demand for aggregates and the actual selection process, because the criteria for arriving at a reduction in the number of indicators were not clear. Such reduction could be achieved in principle through aggregation. However, such aggregation in physical terms, could be carried out only on a limited scale, e.g. by measure of composite indices that typically involved subjective weighting of the original variables.
97. Mr. Hueting stated that reducing the number of indicators too much would result in data that were too partial and possibly misleading. Mr. Bartelmus concurred and stated that some actors in the field of environment statistics wanted to reduce the information load to a "nutshell" size. They felt that data needed to be aggregated in order to have more influence on decision makers.
98. Mr. Lone indicated that one or two environmentally-adjusted domestic production indicators (such as  $EDP_1$  and  $EDP_2$ ), served only as headlines; they represented a starting point. Politicians should understand that, since those

indicators did not provide all the information needed, it was necessary to go further. Even as an economic performance indicator, EDP needed to be supplemented by a number of other indicators to show the direction in which the economy was going. He stated that some of those involved in environmental statistics in Norway had argued that there should not be more than 20 indicators--maybe only 8 or 10 for representative areas. For various management purposes, hundreds or thousands of parameters were required, but headlines were equally necessary.

99. Mr. Norgaard pointed out that data was filtered as it moved from the bottom to the top of the decision-making hierarchy. Although that was an unavoidable problem, it was necessary to look at the structure of the filtration process. He asked whether the Working Group had environmental scientists and ecologists as participants, in addition to the statisticians.
100. Ms. Shah responded that the Working Group was comprised primarily of statisticians from national statistical offices, some of whom had a background in various environmental sciences. Mr. Bartelmus added that a wide spectrum of professionals had been involved in the earlier stages of devising the environmental statistics framework. He emphasized the need for further cooperation between the Statistical Office, and the expertise and constituency of UNEP in the field of environment statistics.
101. Mr. Norgaard emphasized the need to consider the size of a country, for example, India and China as compared to Luxembourg and Norway, when considering the aggregation of indicators and proposed that regional indicators be encouraged.
102. Mr. Bartelmus pointed out, in response, that India had just developed an environment statistics system for the whole country using the FDES. India had found that the framework could be used as a basic tool to give some kind of organization to the statistics before the methodology was developed. In addition, China had started to explore the feasibility of an integrated accounting and statistics project. As far as accounting was concerned, the size of the country was of real concern, particularly as environmental accounting was usually considered at the national level. The same consideration also applied to a certain extent to environment statistics, which usually entailed more detailed monitoring at the ecozone level. Due to the large size of China, one proposal was to assess a major province with clear environmental problems and a good database. The UN Statistical Office would find out later in 1992 whether such a regional approach was feasible.

8. ***Natural Resource Accounting in the Developing World: A Neoclassical Approach***

103. Ms. Hecht presented a paper, *Natural Resource Accounting in the Developing World: A Neoclassical Approach*, written by Mr. Henry Peskin and herself. She explained that their ERA approach had been designed to incorporate environmental considerations into development planning, rather than specifically to protect the environment, like some other approaches. Their approach had been based on three principles: firstly, that the overall purpose of the national accounting system was to support macro-economic decision-making with the objective of maximizing human well-being, as opposed to the overall objective of protecting or conserving natural resources. Although the environment played an important role in human well-being, it should not necessarily be protected under all circumstances. In that context, sustainability referred to sustainable income and not the sustainable management of natural resources or sustainable resource-based income. Similarly, maintaining the value of the capital base meant the total capital base (physical, human, natural) and not only the natural resource component of the capital base. Another implication of the objective was that it left open the possibility of increasing human well-being by converting natural resource capital into other forms of capital. For example, forests could be cut and the physical capital generated could be used to educate the owner, thus transferring natural resource capital into human capital.
104. The third principle was that the approach consisted of economic accounts as opposed to ecological or biological accounts. The approach focused on valuing resources. That value was determined by supply and demand and not just by the value of their existence. For example, a beach on an island with many beaches would not have an economic value to begin with, though it would have a biological value. If a tourist hotel was then built, resulting in a crowded beach and making it difficult to be at the beach by oneself, then pristine beach would become a scarce resource and would have economic value (provided some people wanted it). The approach was thus called a neoclassical approach to accounting because values were determined by supply and demand and not by other functions the resources might provide.
105. Ms. Hecht emphasized that she and Mr. Peskin considered the valuation of environmental goods and services to be possible. Moreover, the valuation should be undertaken so that society had some estimate of how its members valued environmental goods and services. She acknowledged that valuation involved problems of both methodology and data, but they

were not as concerned about those problems as about others for two reasons: firstly, they considered that bad data were better than no data. If one did not value natural non-marketed assets because of a lack of data, then one implicitly assumed that those assets had zero value. The other alternative was to say that society did not know how to place a value on those assets and that it could not therefore use them. Both of those lines of reasoning were problematic. She argued that it was better to work with bad data rather than to assume that values were zero or infinite. The second reason for not being so concerned about problems of valuation was that she and Mr. Peskin viewed the accounting exercise as a first iteration in an ongoing process, not as a one-off process. The accounting exercise would provide criteria according to which data could be further developed and refined depending on their importance--in other words, criteria on how to allocate limited resources for data development.

106. She explained that the approach regarded the environment as a collection of services. For example, it considered a lake not as a discrete geographic entity and thus an environmental asset, but as a collection of services such as water supply, fishing, swimming, transportation and dumping ground for waste. The approach looked at all those services differently. She also cited the example of forests, which provided services for commercial forestry, shade, non-marketed fuelwood, recreation, animal habitat, etc.
107. Ms. Hecht then outlined the basic structure of the accounting framework, which included modified accounts added on to the conventional accounts. The modified accounts incorporated environment in several ways: for instance, they included the household sector as a productive rather than a consuming sector. Fuelwood was the main production item that interested the national income accounting of the household sector. Households took wood from the environment and produced it as an output which was fuelwood. The approach also considered the environment as a provider of waste disposal services to industry and the household on the input side of the accounts. On the output side, the modified accounts contained an item for environmental damages, which was the cost imposed on society (industry and households) by the dumping of waste in the environment. They also incorporated an item for direct consumption of the environment on the output side, which comprised the direct services furnished by the environment such as recreation, scenery and filtration provided by salt marshes. An equilibrating item on the input side - the net environmental benefit - balanced the accounts. That was the sum of waste disposal services, environmental damages and direct consumption of environmental

services. She explained that the modified accounts also incorporated three types of natural resource depreciation: fuelwood biomass stock, resources producing non-marketed services, and resources producing commercial goods. The sum of those depreciation items (with the rest of the modified accounts) produced a modified NNP, and then, with the addition of depreciation of capital and natural resources, produced a modified GNP.

108. Ms. Hecht then outlined the valuation techniques used in the approach, beginning with fuelwood. She stated that the simplest way to value fuelwood was to use its market price, but that would not make sense when there was no market for fuelwood and when people did not have the option of buying it because they did not have incomes. Another method was to value fuelwood based on the amount of time spent on collecting it. In that case, the person doing the valuation needed to know how people used their time and how they valued it. That technique was difficult because it depended on who the people were and whether they had any alternative sources of monetary income. Ideally, one used household surveys to look at time use, income and what kind of options existed in terms of buying fuelwood. Such surveys provided enough data to know what trade-offs were made and whether one could value fuelwood based on monetary income or some other valuation for income. She indicated that the World Bank would hopefully conduct such surveys in Côte d'Ivoire.

109. She pointed out that valuing waste disposal services was relatively straightforward compared to the damages incurred. That was because the approach valued those services in terms of alternative ways of dealing with the waste. For example, in the case of an industry dumping waste into water, one could estimate the cost of building a treatment plant and stopping the dumping. In the United States of America and other Western countries, such calculations were easy because there were regulations requiring industries to build treatment plants and one could simply look at the cost of doing that. In developing countries on the other hand, determining the cost of treating waste was difficult and one therefore had to use ad hoc approaches. One method was to determine how much an industry was dumping and then to use the cost of cleaning up using Western treatment technology. If one could not, however, determine the amount of waste being dumped, one had first to look at what kind of plants existed, including their outputs, and use engineering process information to estimate the standard discharges of waste. One could then apply Western cost data for treatment costs. The same approach could be used for sewer systems. In that case, the person doing the valuation had to decide whether to incorporate the whole cost of the sewer system in the number assigned to

disposal services. One also had to decide whether a different approach to treating sewage could be appropriate in a different context. In that case, Western data on the cost of building treatment plants could then be irrelevant. It was therefore necessary to determine the appropriate technology to use for estimating the cost, but that depended on the country in question and its particular constraints.

110. She stated that the approach did not use the cost of removing environmental damages to estimate their value because, as mentioned earlier, the benefits of eliminating a pollutant could greatly exceed the costs.

111. Ms. Hecht stated that there were many ways of valuing the direct consumption of environmental services, depending on the kind of services in question. In Western countries, where recreation was important, travel models were used to construct demand curves for the environmental services consumed during recreational activities. In countries such as Kenya and Tanzania, the issue of how to value wildlife was particularly important. In Tanzania, for example, hunting permit fees were used for valuation. The Government had estimated the willingness to pay for the right to hunt animals and then set prices accordingly. A similar approach would be to estimate how much people were willing to pay to go and look at a lion or an antelope, and to use that as a basis for valuing those resources. A different approach was used when dealing with pollution control services provided by the environment. When considering the filtration of nutrients out of water by wetlands, for instance, one could estimate the cost of nutrients filtered out each year in one square metre of marsh and compare that with the cost of filtering those nutrients in another way.

112. She emphasized that the valuation methodology used in the approach was very ad hoc. That was why it was important to present the results of applying the approach together with the valuation methodology used and assumptions made. If economists took the estimations as a first step and then argued over the methods and subsequently changed the models, they could reach a point where the valuations could be considered reasonably convincing.

113. Regarding the estimate of natural resource depreciation, she stated that the accounting framework used a depreciation approach, as opposed to the unit rent method. The approach attempted to observe or estimate the change in the net present value of future income streams. It was easy to argue that it was difficult to determine those future income streams. The empirical work in that area, such as that of WRI, El Serafy or Peskin in

Chesapeake Bay, made grossly simplifying assumptions. With increased understanding, better models of future income streams could be built. She also pointed out that the estimation of future income streams was regularly done in commercial capital markets. For example, prospective buyers of a forest would first try to determine how fast that forest generated new growth, how much could be harvested, what was the regulatory environment, what were the anticipated changes in demand for timber, etc. The prospective buyers would then build a model to determine how much they would be willing to pay for that forest. The same kind of procedure could be followed for environmental services. The estimation process would thus take into account similar factors such as population growth, new technologies, changes in demand and the regulatory environment when estimating future income streams. Such estimation was not simple, but it could be worked on. The more models that were produced, the more economists could argue about them and the more an agreement could be reached on how to undertake depreciation estimation.

114. Ms. Hecht reported that she and Mr. Peskin had initiated a project in January 1991, with funding from the United States Agency for International Development (USAID), to construct a natural resource accounting system in the Philippines. Although they had intended to construct comprehensive accounts, at that point, the accounts had not gone as far as she and Mr. Peskin would have hoped. The project had adopted an iterative approach for the construction of accounts and would go through another round to get a new set of data. The ERA approach had been discussed extensively with the Department of Environment and Natural Resources (DENR). Teams of Philippine consultants, who were doing most of the work, the national economic administration, USAID and others involved in the project all agreed that the project should construct national comprehensive accounts, rather than just sector accounts. In the end, however, the accounts concentrated primarily on the forestry sector.
115. She outlined the lessons learnt from the work undertaken in the Philippines. The first was the importance of national accountants and general policy makers taking the lead in constructing natural resource accounts. Even though the Secretary of the DENR had felt that the project should follow a comprehensive approach, those responsible for overseeing the project had had an interest in forestry. Those individuals had been under pressure from the DENR to come up with figures to be used for managing commercial forestry, as opposed to figures for managing the national economy as a whole. As a result, the statisticians had lost interest in the project's overall objective and had therefore ceased to participate. A second



reason for the shift to a forestry focus concerned staffing. The Philippine consultants working on the project were mostly forestry economists who wanted to focus on forestry. Therefore, many of the lessons were institutional in nature, as opposed to being related to the contents of the Philippine accounts and natural resource management.

116. She listed the other lessons of the ERA experience in the Philippines and Indonesia. The second lesson of the ERA experience was that the full-time staff should not be specialists in particular natural resources, but rather low-level generalist economists working under supervision. The third conclusion was that outsiders should perhaps take a major responsibility in ERA projects. The iterative approach depended on publishing the data, results and methodologies so that better data, results and methodologies could be obtained in the next round of development. Governments were less likely to publish the initial data and results than outside consultants, particularly when there were obvious imperfections. She cited the example of the results of the Chesapeake Bay accounting study, which had not yet been released by the US EPA.
117. Ms. Hecht concluded her presentation by stating that, as more accounting exercises and pilot studies were undertaken, a better understanding would be gained of what ERA required, which approaches worked and which ones did not, which techniques and approaches were useful under which context, what the forestry experts needed from the accounts and what was needed by the national accounts experts, senior policy makers, advisers, etc. If asked to choose between that type of approach to ERA, which assumed sustainability and then set prices accordingly, and the type of approach which valued what really existed, she would recommend that both approaches be employed. Environmental and natural resource accountants could then see for themselves where each approach was preferable to the other.
118. Mr. Mäler stated that he liked the accounting system presented by Ms. Hecht, and that it was similar to an ERA system he had developed. He asked if environmental damages for firms in the modified accounts were being double-counted, since the conventional accounts already included the gross return on capital, which captured the damage to firms. He stated that the damage to firms resulted in a reduction in profits that would result in modified relative prices in the economy, which the conventional accounts would capture. If those damages were included in the modified accounts, the damage would therefore be counted twice. He suggested that the

damages to firms could be added to the gross return to capital and deducted from the modified accounts.

119. Mr. Mäler also asked whether the environmental damages reflected accumulated pollutants (for example, accumulated acid deposition) or just the damage flows. The manner in which the approach accounted for the damage (whether it was a stock or a flow variable) made a significant difference. If the damage was a stock variable, it could be related in the accounts to natural resource depreciation.
120. In response, Ms. Hecht agreed that the environmental damages to firms could be highlighted in the conventional accounts and deducted in the modified accounts. She also explained that the figure for environmental damages was a flow variable.
121. Mr. Friend stated that he also liked the approach presented by Ms. Hecht because it clearly specified its ideology. There was an ambiguity, however, in the terminology used. The approach could not be considered as a natural resource accounting (NRA) approach, although it was being referred to as such. He would prefer to call it, "a system of economic and environmental accounting", since the approach linked the environment to the economic factors. He explained that confusion between physical accounting and the type of economic accounting presented was increasing. He emphasized that environmental and natural resource accountants should distinguish between those two approaches.
122. In response, Ms. Hecht stated that the term "natural resource accounting" had been used when the ERA had started and it did not matter what the approach was called. Both types of work needed to be undertaken.
123. Mr. Friend replied that NRA was important for developing countries in order to keep track of the stocks and flows of natural resources. NRA should thus be incorporated in their National Accounting Systems. But the calculations involved in economic and environmental accounting, which were trade-off calculations to some extent and were also necessary, should be kept separate from physical accounting, which was an important management tool. He explained that that dichotomy and confusion had emerged in the UNEP/World Bank Workshop held in Paris, and attention had shifted towards economic and environmental accounting. Integrated accounting was very attractive to decision makers but distracted attention from the need for the physical accounting approach as well.

124. Mr. Norgaard pointed out to Mr. Friend that Mr. Peskin had developed a taxonomy of approaches to environmental and resource accounting which had been published in the paper, *A Survey of Resource and Environmental Accounting in Industrialized Countries*.
125. Mr. Nickum, East-West Center, stated that he could not view the approach presented by Ms. Hecht as a neoclassical approach. He could understand the need to look at trade-offs across sectors, but did not see how aggregation could give a sense of what those marginal trade-offs were.
126. Ms. Hecht replied that data at that level of aggregation was not necessarily used to value trade-offs.
127. Mr. Nickum indicated that the opportunity cost approach for valuing environmental waste disposal services neglected the value of continuing the use of natural processes for waste disposal. He also asked whether the approach was overstating the waste disposal services and understating the net environmental benefits. For example, using the cost of desalinization of water would overstate the volume of waste disposal services.
128. Mr. Nickum expressed concern about the location of environmental waste disposal services in the Hecht/Peskin accounts. He also asked whether the use of treatment costs as a means to value natural purification processes did not seriously overstate the value of treatment where the latter are below carrying capacity.
129. In response, Ms. Hecht stated that the waste disposal services measured the value of the benefit to the polluter of being able to pollute. That value would thus be the polluter's opportunity cost. It was not a net impact on the population.
130. Mr. Mäler pointed out that those waste disposal services could be viewed as a subsidy to the polluter. There was therefore a corresponding value in the conventional accounts that could be identified and highlighted.
131. Mr. Bartelmus stated that there now appeared to be a greater consensus on ERA, with more dominant approaches and fewer dissenting voices. He stated that the UN Statistical Office saw its role as promoting consensus by highlighting the emerging points of agreement in the process of revising the SNA and by also including some of the dissenting voices, which included a number of arguments heard in the Workshop. The Statistical Office had drawn upon the clarity of Peskin's approach in defining

the boundary lines of ERA. The Office had wanted, however, to leave out the additional production account of nature included in that approach in its more conservative ERA system. It had decided to expand the capital account and then to estimate the costs and benefits within the conventional production boundaries. The approach was conservative, but it permitted the system to be closer to the conventional accounts than the formulation of a separate production account with benefits and damage costs as in Peskin's approach. The Statistical Office chose to take a conservative approach simply because contingent valuations proposed in Peskin's system did not appear to qualify for routine application at the national level. While Peskin's approach created opportunities for further studies in limited regions such as the one in Chesapeake Bay, the SEEA demonstrated how it could be extended for research studies applying the Peskin methodology.

132. Regarding the accounting of damages to firms, Mr. Bartelmus was not convinced that the approach presented by Ms. Hecht counted those damages twice, because conventional depreciation included only foreseeable depreciation of produced capital. He explained that, if the depreciation was not foreseeable, as in the case of natural disasters and, to a certain extent, environmental impacts, it was not yet accounted for in the production and income account. Instead, the approach treated such depreciation as capital gains or losses outside the income account. Adding those damages back was feasible, but contradictory to conventional accounting.
133. Mr. Potier stressed the significance of the institutional aspects of the study in the Philippines, which Ms. Hecht had highlighted, and the importance of identifying the data users. Regarding the interactive process to ERA, the OECD was also using that approach where data, regardless of their reliability, were provided to governments and their reactions awaited.
134. Mr. Awan expressed his appreciation of the implication in the approach that trade-offs existed between environmental protection and economic growth.
135. Ms. Hecht responded by stating that the accounting approach was meant to account for what had happened and that models were needed to determine the trade-offs.
136. Regarding the argument about whether a macro-economic or sectoral approach to ERA was better, Mr. Lone pointed out that adopting a sectoral approach to ERA and linking it to the traditional macro-economic accounts and models would help to establish a dialogue between the ministries of

finance and forestry or energy. Such links had been established in Norway. For example, linking separate energy and air pollution accounts to traditional economic modeling permitted the study of all sorts of trade-offs concerning the introduction of pollution abatement policies to reach certain environmental objectives, and reductions in GDP in traditional terms of varying amounts. In addition, some of the direct benefits of those particular policies could be examined, as Norway was doing. Such links created the possibility of a dialogue with the macro-economic planners and the ministry of finance, even if environmental and natural resource accountants constructed only limited physical accounts and linked them to the traditional accounts. He also wondered whether it was possible to identify trade-offs between different valuation approaches and whether they were compatible with each other.

137. Mr. Hueting stated that elimination costs were normally calculated on the basis of the cost of eliminating pollution, while damage costs indicated the cost of compensation for functions or services and for financial damages, etc. He explained that more elimination measures implied decreasing damages. There was thus only one way to treat damage costs. If an ERA approach did not follow that way, then it counted those costs twice. If the approach presented by Ms. Hecht valued the services with the cost of treatment and if that meant the annual cost of a certain treatment to the point of sustainability, then Mr. Peskin, Ms. Hecht and himself were on the same track. If the approach, however, valued the whole capital as a capital good, then they were not on the same track. The approach of Mr. Peskin and Ms. Hecht then implicitly incorporated a preference for sustainability of practically zero because the approach would have to discount future income streams generated.
138. Mr. Hueting also stated that certain damages could not be treated either because the treatment could not be carried out or because it was insufficient. In some cases, the treatment could slow down the rate of deterioration, but could not stop it because of its cumulative nature. Then a direct shift to environmentally friendly activities was necessary to arrive at a sustainable activity level. For example, normal treatment plants did not deal with phosphates and normal biological treatment plants did not treat heavy metals. In such cases, the approach would underestimate the damages.
139. Ms. Hecht replied that as the elimination of the discharges increased, the value of the damages decreased, but the two values were not necessarily equal. She also explained that the treatment cost was estimated to the

point of cleaning up to zero--in other words, all of the discharge. In addition, the approach did not incorporate the demand of future generations. Regarding irreversibility of damages or the lack of a treatment, if no treatment existed (for example, for phosphates), presumably the issue was then related to changing the production process so that the phosphates would not be discharged in the first place.

140. Mr. Hueting responded by stating that the cost of a treatment plant was different from the valuation of the services provided by the environment. The difference was that the treatment plant required reinvestment every few years while the services of the environment were provided forever. If the Peskin and Hecht approach considered the cost as an annual one that went on forever, then they were on the same track as himself, and possibly going a step further. If, however, the approach considered the value of the whole function as a sort of capital good, then their approach was different from his and the argument would revert to the discount problem once again.
141. Ms. Hecht, in response, acknowledged that discounting was an essential feature of the approach, which was linked to the question of depreciation. For example, if a lake was filled with silt because of waste dumping, then the value of the dumping service provided by the lake would depreciate.
142. Mr. Hueting indicated that, as valuation was done on that basis, they completely disagreed. He also stated that, although the Peskin approach was a neoclassical one, quantifying the complete demand was impossible. If the approach was restricted to individual preferences, then it did not capture the whole picture. He explained that the conflict between functions created scarcity.
143. Ms. Hecht pointed out that scarcity could arise because the demand exceeded the supply for a single function and not just because of a conflict between services.
144. Mr. Norgaard summarized the discussion on Ms. Hecht's presentation by stating that it had been an extraordinary session with more issues brought in for discussion. The discussions had been evolutionary, as the process of devising ERA systems should be. He pointed out that there were real advantages in undertaking environmental accounting exercises "crudely", then discussing the results and forcing people to provide inputs. The subject of ERA dealt with great complexities and ERA should be viewed

more as a way of structuring discourse and provoking interaction and dialogue. Historically, science was meant to provide facts for decision makers, then economists stepped in and said they would also provide the truth. But ERA dealt with great complexities and expecting a framework to provide the whole truth was not realistic. Environmental and natural resource accountants currently found themselves involved in such a process, but that was not analogous to how the SNA was established. To some extent, the SNA had structured the discourse for discussions on economic development, but not as much as it should have. Indeed, the SNA should have been a matter of ongoing debate concerning the adequacy of figures provided and with respect to the framework itself. Because the SNA did not undergo an evolutionary process, society and, in particular, environmental and natural resource accountants, were now trying to make a monstrous leap forward. It was therefore necessary to keep that process open and not to take the "here is the answer" approach.

145. Mr. Norgaard stated that, regarding the nature of the Workshop's consensus, the group was becoming comfortable with what was uncomfortable. It clearly did not have a common language and they were therefore still struggling to find a quick way to have a discourse on all the difficulties. He thought the group was becoming more familiar with the pitfalls and dangers of what they were trying to achieve and how important it was to maintain an ongoing process rather than to present answers. Environmental and natural resource accountants should try as much as possible to provide headlines for decision makers, while keeping the underlying information behind those headlines accessible to as many people as possible.

**9. *Presentations by Representatives of Governments, Intergovernmental and Non-governmental Organizations on the Ongoing Work on ERA***

146. Participants representing governments, intergovernmental and non-governmental organizations provided short summaries of their ongoing work on Environmental and Natural Resource Accounting. These included representatives of the People's Republic of China, Finland, Germany, Indonesia, Japan, Norway, Russian Federation, Sweden, United Nations Economic Commission for Europe (ECE), Food and Agriculture Organization of the United Nations (FAO), United Nations Environment Programme (UNEP), United Nations Conference on Environment and Development (UNCED), Organisation for Economic Cooperation and Development (OECD), East-West Center, Thailand Development Research Institute (TDRI), World Institute for

Development Economics Research (WIDER) and World Wide Fund for Nature (WWF) International.

### ***Governments***

#### ***9.1 People's Republic of China***

147. Mr. Li Jinchang, People's Republic of China, provided a brief account of work on ERA in China. He stated that ongoing ERA work in China was based on the assumption that natural resources had a value, that they were considered as assets, and that their increments were regarded as capital formation and their reduction as capital depletion. Three levels for undertaking natural resource accounting had been identified: the first was individual natural resource accounting, which could be further subdivided into material accounting, value accounting, and stock and flow accounting. The second level was integrated natural resource accounting with emphasis on integrated value accounting of natural resources. The third level was the integration of natural resource accounting into the national economic accounting system through the three channels of national wealth accounting, economic output value accounting and input-output accounting.
148. Mr. Jinchang explained that, up to now, research in China had been limited to natural resource accounting. He thought it was necessary for CIDIE to elaborate a programme of action and a work plan in order to organize and coordinate the research on and the application of both environmental and natural resource accounting. He further stated that China would appreciate and fully support that work.
149. Mr. Bartelmus added that the Statistical Office and the UNDP planned to organize an ERA seminar for the Asia and the Pacific region in Beijing, hosted by China, and they were seeking full support for the participation of developing countries.

#### ***9.2 Finland***

150. Mr. Suur-Kujala, Central Statistical Office of Finland, described the various components of Finland's work in the area of environmental statistics and accounting. The first component was natural resource accounts in physical units. The first sector in those accounts was the wood material accounts, which included the flows of harvesting of timber and processing



it as a final wood product and the deposition of various residues in the environment. The wood material accounts had begun in 1980 and the report on the accounts was currently in the process of being printed. The next sector was the energy sector and its relation to land use (built-up areas). In addition, there were special projects, including the construction of satellite accounting systems using a different concept of production with respect to forestry for making calculations regarding natural growth of forests. The Central Statistical Office hoped, that, following close cooperation with international work, it would be able to test the SEEA within a few years. Starting with the SNA, the Office also hoped to do some work on the calculation of environmental expenditure and the valuation of natural stock. He indicated that the Central Statistical Office was planning to work on NRA and the SNA simultaneously.

### **9.3 Germany**

151. Mr. Nick, German Ministry for the Environment, Nature and Nuclear Safety, stated that discussions regarding ERA had intensified in Germany during the past few years. Germany had established a scientific advisory committee consisting of researchers, economists, and staff from the Federal Statistical Office (FSO) and industry and had developed a programme on ERA. The committee had recently submitted its first report. The first result was that the traditional SNA should not be modified or replaced by a new system, but supplemented with environmental data. The second was that the system to be created should be as flexible as possible so that it could be easily modified on the basis of experience acquired. Such flexibility could be achieved by a system consisting of independent subsystems which could be used separately, but were also linked to one another and to the traditional SNA. The third result of the report was an emphasis on physical data, as well as recognition of the need for statistical indicators and monetization. The fourth was that, although the FSO had announced a couple of years previously that it envisaged calculating a green GNP, such a task would not be possible in the foreseeable future. The fifth result was that the SEEA should be included in the approach devised. In other words, the databases developed should be compatible.

152. He stated that one problem in implementing ERA in Germany was the selection of data. For example, one subsystem, which distinguished between 12,000 production processes and 6,000 types of emissions, resulted in a table with 72,000,000 entries, which was considered to be too large. He indicated that there was a great deal of scepticism regarding valuation. In

addition, in 1991, the Ministry for the Environment, Nature and Nuclear Safety had completed a research programme which had been initiated five years previously. The final version of the results of the programme (ten projects) would be available from the Ministry.

#### **9.4 Indonesia**

153. Mr. Suparmoko, Team Leader of Natural Resources and Environmental Accounting Study, Indonesian Ministry of State for Population and the Environment, stated that resource accounting was a new subject for Indonesia. He indicated that, after the findings of the WRI study, there had been increased concern in Indonesia about natural resources and a green GDP as a useful instrument for planning purposes. He explained that work in Indonesia had started with lectures on ERA by Mr. Peskin, Mr. Hueting, and others. The number of methodologies was, however, confusing. In 1991, some of the Indonesian staff had visited Canada and the UN Statistical Office to see what other countries were doing on the subject. Indonesia had decided to begin with a simple approach, that of WRI, even though it might not be the best.
154. He stated that the first stage of work in Indonesia on ERA had involved learning about the concepts and methods of resource accounting. In 1992, Indonesia had begun to compile stocks and changes of key resources, while also attempting to work on land and fisheries, but without much success. In the current year, Indonesia expected to produce figures on resource stocks, especially for oil and gas, and forests.
155. He pointed out that interest in resource accounting had spread to almost every ministry responsible for natural resources, including the Ministry of Forestry, the national mapping and survey agency, and the Ministry of the Interior. He emphasized that, although there were many agencies working on resource accounting, there was no coordination among them. The Central Bureau of Statistics and the Ministry of the Environment were concentrating on NRA and hopefully would produce some figures by the end of 1992. USAID was also involved in that work by funding the visit of Mr. Peskin and Ms. Hecht to Indonesia to start applying their approach. The Government of Indonesia felt that the Peskin approach could result in producing a green GDP, while the WRI approach, which handled only a number of resources, would not. Indonesia was still not quite sure which approach was the best. Perhaps the WRI approach was good for planning purposes, while the Peskin approach was better for calculating a green GDP.

He indicated that there were many problems with respect to ongoing work on ERA in Indonesia, such as data collection, personnel shortage, and lack of resources.

156. Another issue of particular importance which he mentioned was the setting of prices of finished wood products in Indonesia. He stated that using international prices resulted in lower rates paid by the concessionaires to the Government. A small percentage of the profit was realized by the concessionaires, but the highest percentage went to the industrial sector--in other words, those processing the wood. Using the domestic prices, on the other hand, gave a better indication for valuation. He wondered how the fees or royalties which the concessionaires should pay to the Government and which would maintain sustainable development should be determined.

## 9.5 *Japan*

157. Mr. Morita, Japanese National Institute for Environmental Studies (NIES), reported that he was currently working as a team leader for the Global Warming Response Project within the NIES. In 1991, the Environmental Agency had requested him to organize a joint resource project on ERA in Japan with the economic planning agency, the Ministries of Agriculture, Fisheries and Forests, and several universities. He referred to two papers, one on ERA and the other on *Pollution in Japan: Our Tragic Experiences--Case Studies of Pollution Related Damages*. He indicated that Japan had done a great deal of work on ERA in the 1970s, but that, recently, little activity had taken place in national welfare estimation for two reasons. The first was the drastic improvement in pollution levels in Japan, and the second was the establishment of a nature conservation system. Those developments had decreased the incentive to continue research on ERA.
158. He stated that Japanese forest resources were increasing and that expenditure for environmental conservation had been decreasing since the 1970s. He also stated that there was a decrease in external diseconomies of air pollution, estimated by the Hedonic approach, reflecting a dramatic improvement in air pollution levels.
159. He indicated that the situation in Japan had changed again since 1987. The Government had now acknowledged Japanese responsibility for the deterioration of the global environment. He pointed out that Japan had been exposed to strong criticism regarding deforestation of tropical rainforests, declining fisheries, and the decrease in wildlife animals. A main criticism

was that Japan concentrated on protecting its own environment while destroying foreign and global environments. For that reason, the Environmental Agency had initiated the research project on ERA. Japan had a special strategic purpose for establishing an ERA system, namely to clarify the relationship between economic activities and the global and foreign environments and to assess Japanese activities from the point of view of global sustainable development.

160. He explained that the project was trying to link Japanese physical domestic accounts with global and foreign accounts. There was not yet a framework to link the physical system to an economic accounting system. The project had tried to estimate the monetary cost of the Japanese use of the global and foreign environment. An economic framework for ERA was needed to clarify the relationship between Japanese economic activities and their impact on foreign and global environments. Japan therefore found the SEEA to be an attractive approach, especially because it included provisions for dealing with the rest of the world which Japan would expand on. He stated that Mr. Hueting's framework was also attractive because the Netherlands had tried to expand the accounting system to allow for global accounting and developing a component for imports and exports. He asked whether the Norwegian approach could be expanded for possible use in Japan.
161. Mr. Morita finally stressed the importance of including global environmental issues in an environmental accounting system and the need for an international resource and pollution accounting system which could analyze solutions for developing countries. He concluded by stating that Japan hoped to contribute to collaborative work on ERA.
162. Mr. Hueting stated that the most important environmental problems were global problems. In addition, the contribution of industrialized countries to global problems was, in many cases, greater than that of developing countries. One should therefore start from the global problem and then look at the contributions of countries to that problem. He added that industrialized countries bought resources from developing countries at a price far below the costs of sustainable exploitation and that developed countries should involve themselves in research along those lines.
163. Mr. Bartelmus stated that, in the opinion of the UN Statistical Office, it was not sufficient to include just a sector for the rest of the world, which was only a starting point. The inclusion of transboundary flows was important, but a harmonization of the approaches was needed in order to

show the flows from one country to the other, to facilitate comparisons, and to determine where some of the transboundary flows ultimately ended. He added that there were enormous problems in assessing the pathways of certain pollutants, which was easier in the case of transportation of solid waste as reflected in the SEEA. He emphasized that further research was required in that area.

164. Mr. Friend stated that he would like to see the industrialized world provide an estimate of the consequences of the global environmental externalities for which it was responsible. He pointed out that the work undertaken in Japan was a kind of audit for Japan; it dealt with more than transboundary flows--it described the impact of Japan purchasing forests (in other words, the impact of trade), especially the external impact of industry on the rest of the world. He indicated that the construction of such "trade accounts" would be useful for assessing the cost-benefit of international trade on the global environment.
165. Mr. Norgaard stated that there was an issue of double counting if Indonesia was examining the impacts of exporting forest resources, while Japan was examining the impacts of importing forest resources. He emphasized that it was very important for the developed world to take a lead in trying to look at its own impacts, but it was also important for small countries, particularly those involved in a lot of trade, to do the same.
166. Mr. Hueting stated that accounting for transboundary flows was not difficult. For example, in the case of carbon dioxide emissions, the approach described in the report, *Methodology for the Calculation of Sustainable National Income*, would first ask what the global level of emission of carbon dioxide and that of the sustainable emission of carbon dioxide were. One would then know by how much emissions of carbon dioxide should be decreased and what the contribution of the Netherlands, for example, to global emissions was. From that, one could obtain the necessary information on the level of carbon dioxide emissions, which should be decreased in the Netherlands and then estimate the cost of measures required to achieve the sustainable level of emissions. With that sustainability cost, one would know the gap between the sustainable activity level and the current activity level. Such information was of key importance because it was needed to achieve sustainable use of resources.
167. Mr. Hueting also pointed out that there should be no double-counting in the approach referred to. That was because the approach would begin by determining the price of harvesting in the last year in a sustainable way

and comparing that with the actual cost incurred in that same year. The difference between the two figures would be the divergence between sustainability and unsustainability. It was quite illogical to deduct the total amount of cost involved, from the GDP of the exporting country to get a sustainable national income because, for the amount which was exported, the difference was deducted in the GDP of the importing country.

## 9.6 Norway

168. Mr. Lone referred to the document distributed on the Norwegian experience and that of the Norwegian Central Bureau of Statistics (CBS), *Natural Resources and the Environment 1990*, in which most of the modeling and estimates work on natural resource accounting was described. Another of those reports would be published in a few months. Historical material on the development of resource accounts in Norway up to 1987 could be found in two documents, one of which he had prepared (Alfsen *et al.* (1987), *Natural Resource Accounting and Analysis: The Norwegian Experience 1978-1986*, Oslo: Central Bureau of Statistics; and Lone (1988), *Natural Resource Accounting: The Norwegian Experience*, OECD Environment Committee, Paris).
169. Mr. Lone pointed out that Norway had more than 15 years of experience in physical accounting, which was referred to as natural resource accounting. Norway had started with energy material balances and reached the conclusion that they were not very useful for policy management purposes. It had therefore concentrated in recent years on energy and air pollution accounts or inventories, which were not actually of the material balances type. Those accounts were of the input-output sector commodity classification type providing physical input-output information.
170. Mr. Lone stated that the main use of those accounts was in linking them to economic accounts and macro-economic modeling. The Ministry of the Environment felt that the accounts were a success and they had become very important for Norwegian policy decisions, both within the Ministry of the Environment and the Ministries of Finance, Oil and Petroleum, and Transportation. The modeling exercises were useful in both the short- and long-term macro-economic models for analyzing the consequences of the base scenario economic reference path for emissions of air pollutants. When those consequences were related to environmental objectives, one saw that there was a long way to go with policy measures. Some policy measures, such as tax reforms, direct cleaning measures and technological

requirements, were introduced into the model which, in theory, meant reaching environmental objectives, but at some cost in terms of traditional GDP growth and income. One could thus compare those policy measures and environmental objectives with GDP figures. In addition, Norway had done some limited work on trying to establish the linkages between the various direct damage costs, but it had been found to be difficult.

171. He indicated that Norway had not tried to calculate an adjusted GDP. It found the modeling exercises to be a very valuable alternative because they focused on specific problems which were of importance for policy-planning purposes. Norway felt that not only were the flow figures such as GDP important when talking about sustainable development, but so were the stock figures. In addition to physical resource stocks, Norway also tried to evaluate some of the stocks which had commodity value for production, for example, petroleum stocks, hydroelectric reserves, fisheries, and forest reserve stocks. Although some of the forest stocks were already included in the capital accounts in national accounting, what had been done was not sufficient even from the commercial point of view.
172. He stated that the Ministries of Petroleum and Finance had also calculated petroleum wealth based on the net present value of future income streams. If one added petroleum, hydropower, and revalued forest stocks to the capital stocks in the national accounts, those capital stocks increased by about 40 per cent. For those resource stocks, the inclusion in the capital accounts underlined their importance, even if they were limited to resources having market value. The effects on savings, rather than on GDP, had been examined. Adjusting the capital changes for the changes in oil, gas and petroleum stocks had a major impact on savings levels. That had drawn the attention of the Ministry of Finance to the usefulness of NRA.
173. Mr. Lone explained that, in addition to those stocks which had a commercial market value, ecological capital was best captured by some sort of environmental indicators. The Ministry of the Environment was, however, dissatisfied with the work done to date in Norway and in other countries and international organizations on indicators. In its view, the work done by the OECD placed too much emphasis on the pressure-stress emission indicators and too little on the actual state of the environment response-effects indicators. Norway was trying to work on that and had achieved some progress which should be documented in the forthcoming report on natural resources and the environment in Norway. To summarize, Norway felt that, by using the value of the stocks and the physical resource accounting to put traditional fixed capital and national accounting together with the value of

the additional natural resource stocks, as well as some commodity value for those, one started to get closer to the concept of national wealth, which should be the benchmark for sustainability.

### **9.7 Russian Federation**

174. Mr. Morozov, Ministry of Ecology and Natural Resources of the Russian Federation, thanked the CIDIE Secretariat for the invitation to attend the Workshop on ERA, which was a new subject for the Federation. He indicated that, for a number of years, another statistical approach had been applied in the Federation based on the theory of material production. The Federation was now considered to be a country in transition from a centrally planned economic system to a market based one and was therefore starting to develop the national accounting system. The economic situation was not, however, easy and it would take some time to change from one system to the other.
175. He stated that the topic of the Workshop was important for the Federation, which was rich in natural resources, but needed to know how to use those resources in an ecologically sound and balanced manner to improve the standard of living and provide solutions to economic and social problems.
176. He pointed out that, based on the Workshop discussion, there was no absolute solution to the issue of ERA. He stated that, before talking about the rights of future generations, one should first try to establish the current generation's rights to those resources.
177. He stated that the Federation was undertaking some studies on national accounting, in particular, in the field of environmental protection. The Ministry of Ecology and Natural Resources had launched such a programme and was interested in the discussions at the Workshop. The Ministry would use the knowledge gained through the Workshop and the documentation provided to learn more about ERA and the different experience gained in both developed and developing countries. He indicated that the Federation would like to contribute to such important work with respect to developing ERA and pointed out that all of the countries of the former Soviet Union and of Central and Eastern Europe were in the same situation with respect to ERA.



178. Mr. Averchenkov, Ministry of Ecology and Natural Resources of the Russian Federation, proposed, on behalf of the Russian Federation, that an international project be launched under the auspices of UNEP on the possibility of introducing ERA in the Russian Federation and other countries in transition. He requested that UNEP and other international organizations provide assistance to establish ERA systems in countries in transition.
179. In response, Mr. Osman, UNEP, stated that UNEP had noted the proposal and would follow it up. He added that, during the Executive Director's recent trip to the Federation, assistance with ERA had been one of the issues discussed.
180. Mr. Friend pointed out that the Russian Federation had a window of opportunity to create a more integrated approach during the process of reform and transition towards the SNA. It would be a pity to reject out of hand the material product accounting system (MPAS) in favour of the SNA without considering how to incorporate the best of both systems. MPAS, for instance, provided a useful bridge, like the I/O system, in linking NRA with economic accounting.
181. Mr. Lone mentioned that the Statistical Division of the ECE had a Task Force on Environmental Accounting. In addition, the ECE's Joint Working Group of Senior Economic Advisers and Environmental Advisers had looked into economics and the environment, as well as accounting and modeling, with particular focus on countries in transition. He added that the OECD had a Centre for Cooperation with Central and Eastern Europe which was also involved in similar work.
182. Mr. Bartelmus further informed participants that the Inter-Governmental Working Group on the Advancement of Environment Statistics had decided that countries in transition should be encouraged to participate in discussions on environment statistics and resource accounts. A number of countries had already announced that they would invite some of those countries to the forthcoming Wiesbaden meeting of the Working Group. There was, however, a financing problem in involving all of the countries, arising partly from competition for funding by developing countries. The UN Statistical Commission hoped that at least some of the countries in transition would be able to participate in the Wiesbaden meeting.

## 9.8 Sweden

183. Mr. Mäler reported on ERA activities in Sweden. He stated that the Swedish Government had appointed a commission which had produced a report on ERA in the late spring of 1991. The Government was planning a bill, which would probably soon be made public, to be presented to Parliament. A Government decision, based on the bill, would decide the future direction of ERA work.
184. Mr. Mäler stated that the commission's report contained three recommendations: the first was that Sweden should improve its environmental statistics and make them compatible with input-output statistics (as in Norway) in order to make modeling possible. The second was that Sweden should develop some indicators on the state of the environment. The third was that Sweden should create satellite accounts along the lines suggested by the UN Statistical Office, but modified to introduce various kinds of experiments on how to design those accounts in detail. The commission had also suggested the further development of the Statistical Office's system in the direction proposed by the WIDER theoretical research. He added that the commission's report was now available in English.

## *International Organizations*

### 9.9 *United Nations Economic Commission for Europe (ECE)*

185. Mr. Nevalainen, United Nations Economic Commission for Europe (ECE), reported that the ECE Task Force on Environmental Accounting was concentrating on physical accounting, giving due consideration to environmental and ecological problems. He referred the participants to an ECE document, *Approaches to Environmental Accounting, CES/700* providing a brief description of what was taking place at the ECE.
186. He informed the Workshop that the Intersecretariat Working Group on Environmental Data, whose next meeting would be held in Geneva in May 1992, was a coordination group involving those who were responsible for international environmental databases. It had not been set up for the purposes of data collection. He added that the ECE had an international environmental data service designed to help those who were in need of comparable, internationally-accepted environmental data.

**9.10 Food and Agriculture Organization of the United Nations (FAO)**

187. Mr. Condos reported that the FAO had recently established an interdepartmental group to find out what the FAO should do in the field of environmental accounting. At least three departments (fisheries, forestry and agriculture) were involved in technical work whose results would be relevant for resource accounting. He added that the agriculture department intended to undertake a study on soil depletion and its economic significance as a pilot study in resource accounting with monetization.

**9.11 Regional Activity Centre for the Priority Actions Programme of UNEP - Mediterranean Action Plan**

188. Mr. Pavasovic, Director of the Regional Activity Centre for the Priority Actions Programme of UNEP - Mediterranean Action Plan, stated that the Programme was involved in coastal zone management in the Mediterranean region under the auspices of the Barcelona Convention and was implementing a number of activities in coastal zone management, including several coastal area management programmes in Croatia, Greece, Turkey, and Syria. The Programme was now preparing programmes for Albania, Egypt and Tunisia. The Mediterranean Action Plan had realized that it should start introducing tools related to the economic aspects of coastal zone management, and the Programme was therefore trying to see how work in ERA could be used for their purposes. He added that government statistics offices in the Mediterranean Area were far behind on the subject. Although the subject of environmental statistics and environmental and natural resource accounting was of great interest to Mediterranean countries, a lot of work in the area needed to be undertaken, particularly regarding the establishment of environmental statistics. He further stated that the Regional Activity Centre would try to develop a proposal on introducing environmental statistics and natural resource accounting in the Mediterranean countries together with UNEP. He invited practical proposals in that area from participants in the Workshop.

**9.12 United Nations Conference on Environment and Development (UNCED)**

189. Ms. Mwagiru, UNCED Secretariat, stated that, during the UNCED preparatory process, the role of the UNCED Secretariat had been mainly to listen to governments, experts and other UN agencies in order to guide its work. The discussions and the exchange of ideas on environmental and natural resource accounting were of great interest to UNCED, particularly within the context of Agenda 21. The costing of programmes for implemen-

tation under Agenda 21 should incorporate some elements of environmental and natural resource accounting now under discussion in the Workshop and other related fora. She stated that the negotiations currently under way on conventions on biological diversity and climate change would also have to take account of the new directions in costing.

### **9.13 Organisation for Economic Cooperation and Development (OECD)**

190. Mr. Potier referred participants to a document, *Environmental Accounting: The Approach and Activities of the OECD* describing OECD activities in ERA. He further reported that the OECD was currently working on the elaboration of a project and programme appraisal manual on including environmental considerations in cost-benefit analysis. He added that the OECD would like to contribute to any kind of work emerging from the Workshop's recommendations.

#### **NGOs/Research Institutions**

### **9.14 East-West Center**

191. Mr. James Nickum, East-West Center, reported that researchers had published a number of books and reports during the past decade on applications of economic valuation to the environment. In 1991, the Environment and Policy Institute (since June 1992, renamed the Program on Environment) of the East-West Center had continued work on a report on economic valuation of urban environmental problems in Asia for the Urban Development Division of the World Bank. The study, carried out under himself and Mr. Yok-Shin Lee, would appear shortly as a report of the IBRD-Habitat-UNDP Urban Management Program. It examined and applied techniques for evaluating four different categories of impacts (productivity, health, ecological value and amenity) in three problem areas (pollution, congestion, degradation of natural support systems). It also looked at scale effects and poverty interactions.
192. He reported that at the macro-economic level, Mr. Kirk Smith was developing a Natural Debt index for greenhouse gas emissions in different countries. In addition, the Center's graduate students were doing research on natural resource accounting.

### **9.15 Thailand Development Research Institute (TDRI)**

193. Ms. Boontherawara, Thailand Development Research Institute (TDRI), stated that, although she was not representing the Government of Thailand, she would give a brief account of two TDRI activities in relation to ERA in Thailand. The first concerned sustainable future development scenarios and involved the modeling of resource depletion and economic growth in Thailand using a general equilibrium approach for constructing a quantitative model of natural resource depletion and environmental degradation. She explained that linkages between those two elements would be established and the model would be integrated into a macro-economic model. Based on that integrated model, the impact of economic growth on resource use and environmental quality (and vice-versa) would be evaluated. Policy recommendations would follow and a sustainable path would be formulated. She added that the activity was more academic and theoretical in nature. The second activity, which was funded by the World Bank, consisted of trying to adjust the national income accounts with respect to the forestry and mineral sectors. She explained that the project would use the depreciation and user cost approaches.
194. Mr. Bartelmus stated that he hoped that the work done by TDRI would be integrated into that of the National Social Development Board of Thailand involving the production of modified national accounts. Based on the experience of the Statistical Office in Latin America, it appeared that those who dealt with the national accounts were better qualified for the implementation of ERA than the environmental specialists. Implementation of ERA should not, however, go ahead without their participation. At the Costa Rica meeting, it had been recommended that national accounting agencies, which could be part of statistical offices, should be the ones to initiate and develop ERA programmes.

### **9.16 World Institute for Development Economics Research (WIDER)**

195. Mr. Mäler reported on the activities of the World Institute for Development Economics Research (WIDER) in the area of ERA. He pointed out that WIDER had dealt with the subject of resource accounting and national income accounting in its programme on the environment and emerging development issues. It had invited scholars to a conference held in September 1990 to discuss various aspects of national income accounting. Based on some reviews of the subject, it had started to develop the theoretical basis for environmental accounting. WIDER had not tried to implement those theoretical concepts, but the results were similar to the accounting system

devised by Peskin. There were interesting connections between the NNP arrived at through those concepts and the idea of sustainable income, because one could show, along the lines of Weisman, that that measure would be sustainable income. The measure was not necessarily positive. It gave the maximum consumption of all goods and services, including environmental ones, which could be sustained forever. He informed the Workshop that a WIDER report on the subject was available.

### **9.17 *World Wide Fund for Nature (WWF) International***

196. Mr. Sheng stated that ERA was a relatively new subject for WWF. He reported that WWF had recently established a sustainable resource use unit within its conservation policy programme and natural resource accounting was included in its programme for 1992/93. He added that WWF was seeking opportunities to work with national governments, international organizations and NGOs, and would be looking forward to participating in the implementation of the recommendations coming out of the Workshop.

### **10. *Concluding Remarks***

197. With regard to conclusions and recommendations for future action, Mr. Norgaard emphasized the need to present environmental accounting in a more constructive manner to development banks and funding agencies. ERA was extremely productive in framing discussion in general, framing the development of better environmental data, and framing the discussion on what was wrong with development paths and how they could be corrected. He wondered how the process of ERA development could be formalized, not in the sense of agreeing on one method, but in the sense of how to increase the learning and feedback process between those collecting environmental statistics, those working on valuation, and those proposing to look at the interaction between economic indicators and physical indicators. Formalizing that process should involve the acceptance of multiple methodologies on the grounds that each methodology was providing different and critical information. The Workshop should also formulate a common plan for facilitating learning and feedback among the different actors so that the UN Statistical Office could evolve frameworks for environmental accounting as effectively as possible. Such a common plan would enable the participants to come to future meetings with a more common language and to be more adept at communicating the strengths and pitfalls of each of the methods and their implications for the future collection of environmental data. The

Workshop should also consider how to be more effective in communicating with the various disciplines so that ERA was thought of as being used by all actors for different purposes, as was the SNA. In that way, the different users could become involved in the debate on the direction of ERA development, rather than a small group such as the Workshop taking up the entire burden of complete development of an appropriate methodology for directing the development planning process. The first step had been to formalize a pluralistic approach, then provide an indication of how it could be achieved most effectively, and finally to determine how to proceed from there, mainly on the basis of the experience of the past five years.

198. He emphasized that the group needed to present a positive, constructive case for pursuing ERA at a significantly higher level. That partly involved the need to educate those who had expectations of ERA on how some of those expectations were too narrow for various purposes. In addition, some of those expectations did not necessarily reflect what the actors associated with ERA development wanted to, or even could, accomplish. Secondly, the Workshop needed to define what was important about the process of ERA development in a positive and broad way. Thirdly, the Workshop needed to come up with a plan for making that process more effective, including how to get more constructive feedback among the various activities taking place.
199. Mr. Abaza emphasized the need to provide specific recommendations on the use of environmental and resource accounting to CIDIE member institutions and to other development assistance institutions.
200. Mr. Condos referred to a paper written by Perrings and others for the FAO on resource accounts constructed for Botswana. When the FAO subsequently sent a mission to Botswana to discuss the subject, no one in the Government knew anything about the accounts. Since the development banks would have to redirect resources to introduce ERA, they would have to know whether there was a greater return on those kinds of investments elsewhere. Mr. Condos stressed that the introduction of ERA therefore had to meet the specific needs of a country.
201. Mr. Friend indicated that the Workshop needed to clarify what it was considering in terms of action. He stated that the structure of information bases was out of phase with the political direction most countries were taking. Sustainable development was one aspect of that political direction. The other was the development process, which was also changing. That new political direction also involved attempting to provide relevant information for the changes taking place. He explained that NRA provided

a framework within which that information could be organized. Although some observers of the efforts in NRA worried about the amount of new data that would need to be generated, it was not as formidable as they imagined, as there was already a lot of data available. In addition, the institutions for undertaking the organization of that data and the development of accounts already existed. An NRA framework should be of interest to development banks because it provided just the kind of information they required to promote "sustainable development" planning. Thus, NRA should be an attractive proposition for funding in individual countries.

202. Mr. Norgaard proposed that, for key resources such as tropical rainforests, UNEP and one of the major development banks should try to synthesize what the scenario for the sustainable development of forest use would look like and see what prices that would suggest. Those prices, rather than current prices, could then be used like national shadow prices in accounting exercises. How such a scenario could be evolved in the absence of a complete consensus on sustainable tropical forestry policy would be difficult and alternative scenarios would therefore be needed. He pointed out that dealing with such global resources would be difficult to do on a country basis. Mr. Friend suggested that such an exercise should be done as a case study.

203. Mr. Mäler suggested that the Workshop try to explain the different objectives of an accounting system, which could have different uses. For example, one could use an aggregate concept like NNP to evaluate marginal changes in the economy such as marginal product, policy reforms, etc. By talking in marginal terms, one had to restrict oneself to changes which would not disturb the price structure. For cases where the price structure was altered, one needed a non-linear index. But, in the accounting framework, one was limited to a linear index. One objective of an accounting approach could therefore be to create an index for evaluating marginal projects. Such an approach would not provide information about wealth or allow comparisons across borders or over time. In order to incorporate those items, one needed to adjust the NNP index further. An index to monitor whether the growth in the economy was sustainable or a database for macro-economic policies might also be needed. If a database for environmental policy analysis was to be established, then the SEEA or the physical resource accounting approaches of Norway or France could be used. Regarding the issue of whether to adopt one approach as opposed to different approaches, he expressed the view that one approach would make it easier to compare results among countries.



204. Mr. Friend pointed out that the question of dealing with the environment in terms of physical information could be split into two parts: the first was spatial databases, which concerned the need for monitoring the state of the environment. The second was NRA, which monitored the stocks and flows in aggregate terms. Then there were the linkages of resources to the economy. He explained that, while most of the discussions focused on those linkages, the spatial databases and NRA were prerequisites that could not be separated from the linkages. He further stated that national accounts were not completely developed in developing countries, or even in all developed countries. National balance sheets were only done in a few countries and he did not think that any developing country had constructed them. He stressed that assistance for developing countries in the area of ERA was required.
205. He also stated that the GEMS, GRID and SOE programmes of UNEP were independent of NRA and stressed that they would benefit enormously from being integrated into NRA frameworks. He added that interlinkages between the databases of GRID and NRA would be very beneficial and indicated that inclusion of those elements in the UNEP/UN Statistical Office work would be useful.
206. The Workshop agreed that the conclusions and recommendations of the background paper prepared by the CIDIE Secretariat and the points of consensus proposed by Mr. Lone would provide a good basis for a plan of action.
207. A drafting committee was established to draw up a set of conclusions and recommendations for future action. After discussion and amendments to the draft document prepared by the drafting committee, the Workshop agreed upon a set of conclusions and recommendations for future action, which appear in Annex II.
208. Mr. Osman, on behalf of UNEP, concluded the Workshop by thanking the participants for their contributions and expressing UNEP's appreciation for the candidness of the discussions. Finally, he thanked Mr. Norgaard for acting as coordinator.
209. Mr. Abaza, on behalf of CIDIE, thanked participants for their contributions and inputs to the discussions. 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 Mr. Norgaard for acting as coordinator.



**Annex I**  
**List of Participants**

**COMMITTEE OF INTERNATIONAL DEVELOPMENT INSTITUTIONS  
ON THE ENVIRONMENT (CIDIE)  
WORKSHOP ON ENVIRONMENTAL AND NATURAL RESOURCE ACCOUNTING**

**LIST OF PARTICIPANTS**

**GOVERNMENT REPRESENTATIVES**

**CHINA**

Mr. Li Jinchang  
First Vice-Director  
Modern Policies Research Center of  
Environment and Economy  
No.115 Nanxiaojie Xizhimennei  
Beijing, 100035  
CHINA  
Fax: 6011194  
Tel: 832 9911-309  
Telex: 222359 NEPA CN

Mr. Hu Rongmei  
Deputy Representative of the People's  
Republic of China to UNEP  
Permanent Mission of the People's  
Republic of China to UNEP  
P.O. Box 30947  
Nairobi  
Fax: 521260  
Tel: 521923

**FINLAND**

Mr. Markku Suur-Kujala  
Head of Department  
National Accounts  
Central Statistical Office  
P.O.B. 504  
SF-00101 Helsinki  
FINLAND  
Fax: 358 0 1734 3429  
Tel: 358 0 1734 3437

**GERMANY**

Mr. Joachim Nick  
Government Adviser  
Federal Ministry for the Environment,  
Nature and Nuclear Safety  
P.O. Box 120629

66

D-5300 Bonn 1  
GERMANY  
Fax: 49 228-305 3524/3225  
Tel: 49 228-305 3203

**INDONESIA**

Mr. M. Suparmoko  
Team Leader of Natural Resources and  
Environmental Accounting Study in  
Indonesia  
Ministry of State for Population and  
the Environment  
Jalan Medan Merdeka Barat No.15  
3rd Floor  
Jakarta Pusat  
INDONESIA  
Fax: 62 21 5705321/3857578  
Tel: 62 21 3857578/5704524

**JAPAN**

Mr. Tsuneyuki Morita  
Head, Global Warming Response Project  
National Institute for Environmental  
Studies  
16-2, Onogawa, Tsukuba  
Ibaraki 305  
JAPAN  
Fax: 81 298 58 2645  
Tel: 81 298 51 6111 Ext. 393

**NETHERLANDS**

Mr. Roefie Hueting  
Department of Environmental Statistics  
Central Bureau of Statistics  
P.O. Box 959  
2270 AZ Voorburg  
NETHERLANDS  
Fax: 31-70-387 7429  
Tel: 31-70-337 4881

**NORWAY**

Mr. Øyvind Lone  
Adviser  
Ministry of Environment  
Myntgt.2  
P.O. Box 8013 DEP

67

N-0030 Oslo 1  
NORWAY  
Fax: 47 2 34 95 60  
Tel: 47 2 34 90 90  
Telex: 21444

**RUSSIAN FEDERATION**

Mr. A.A. Averchenkov  
Deputy Minister for Ecology and  
Natural Resources  
Ministry of ECOLOGY and Natural  
Resources  
107078  
P.O. Box 438  
Moscow  
RUSSIAN FEDERATION  
Fax: 2075628  
Tel: 125-52-82

Mr. Serguei N. Morozov  
Director  
Centre of International Projects  
Ministry of Ecology and Natural Resources  
107078  
P.O. Box 438  
Moscow  
RUSSIAN FEDERATION  
Fax: 207 -56-28  
Tel: 207 -47-84  
Telex: 411882 CIP SU

**UNITED STATES OF AMERICA**

Mr. John K. Atchley  
Permanent Representative to UNEP  
Permanent Mission of the United States  
of America to UNEP  
P.O. Box 30137  
Nairobi  
Fax: 254 2 340838  
Tel: 254 2 334141

**INTERNATIONAL ORGANIZATIONS****ECONOMIC COMMISSION  
FOR EUROPE (ECE)**

Mr. Kari Nevalainen  
Statistician  
Statistical Division  
Economic Commission for Europe  
Palais des Nations  
1211 Geneva 10  
SWITZERLAND  
Fax: 41-22-733 98 79  
Tel: 41-22-734 60 11 Ext. 4154

**FOOD AND AGRICULTURE  
ORGANIZATION OF THE  
UNITED NATIONS (FAO)**

Mr. Apostolos Condos  
Senior Economist  
Economic and Social Policy Division  
Food and Agriculture Organization of  
the United Nations  
Via delle Terme di Caracalla  
00100 Rome  
ITALY  
Fax: 396-57 97 31 52  
396-57 82 610  
396-57 97 51 55  
Tel: 396-5797 4217  
Telex: 610181 FAO 1

Mr. Hotakhanh  
Statistician  
FAO  
Via delle Terme di Caracalla  
00100 Rome  
ITALY  
Fax: 396-57 97 31 52  
396-57 82 610  
396-57 97 51 55  
Tel: 396-5797 5229  
Telex: 610181 FAO 1

**UNITED NATIONS ENVIRONMENT  
PROGRAMME (UNEP)**

Mr. Salih Osman  
Assistant Executive Director for  
Policy Development and Inter-agency Affairs  
P.O. Box 30552  
Nairobi  
KENYA  
Fax: (254 2) 217873/226886/226890  
Tel: 230800/520600

Mr. Hussein Abaza  
Assistant Policy Adviser to the Executive  
Director and CIDIE Coordinator

Mr. Uttam Dabholkar  
Chief, Development Planning and  
Deputy Coordinator, Support Measures

Mr. Derek Eaton  
Research Economist  
Office of the Executive Director

Ms. Monica von Mentzingen  
Associate Programme Officer  
Office of the Executive Director

Mr. Arsen Pavasovic  
Director  
Priority Actions Programme Regional  
Activity Centre  
Kraj sv. Ivana 11,  
58000 Split  
CROATIA  
Fax: (3858) 361677  
Tel: (3858) 43499/591171

**STATISTICAL OFFICE OF THE  
UNITED NATIONS**

Mr. Peter Bartelmus  
Officer-in-Charge  
Environment and Energy Statistics Branch  
Statistical Office of the United Nations  
Department of International Economic  
and Social Affairs  
Room DC2-1652



70

2 UN Plaza  
New York, N.Y. 10017  
UNITED STATES OF AMERICA  
Fax: 1 212 963 4116  
Tel: 1 212 963 4581

Ms. Reena Shah  
Associate Statistician  
Statistical Office of the United Nations  
Department of International Economic  
and Social Affairs  
Room DC2-1656  
2 UN Plaza  
New York, N.Y. 10017  
United States of America  
Fax: 1 212 963 4116  
Tel: 1 212 963 4586

**UNITED NATIONS CONFERENCE  
ON ENVIRONMENT AND  
DEVELOPMENT (UNCED)**

Mrs. Wanjiku Mwangi  
OIC, Environment and Development Officer  
UNCED Nairobi Liaison office  
P.O. Box 30552  
Gigiri Block F-207  
Nairobi  
KENYA  
Fax: 2542 521162  
Tel: 2542 230800/520600 Ext.7104

**ORGANISATION FOR ECONOMIC  
COOPERATION AND  
DEVELOPMENT (OECD)**

Mr. Michel Potier  
Head, Economic Division  
Environment Directorate  
OECD  
2 rue André-Pascal  
75016 Paris CEDEX 16  
FRANCE  
Fax: 33-1 45 24 78 76  
Tel: 33-1 45 24 93 05  
Telex: 620160

**ISLAMIC DEVELOPMENT BANK**

Mr. Kazim Raza Awan  
 Economist  
 Operations Technical Services Unit  
 Islamic Development Bank  
 P.O. Box 5925  
 Jeddah 21413  
 SAUDI ARABIA  
 Fax: 636 6871  
 Tel: 636 1400 Ext. 3335  
 Telex: 601137 ISDB SJ  
 601407

**NGOs/RESEARCH INSTITUTIONS****EAST-WEST CENTRE**

Mr. James E. Nickum  
 Research Associate  
 East-West Center  
 1777 East-West Rd  
 Honolulu, Hawaii 96848  
 UNITED STATES OF AMERICA  
 Fax: 1 808 944 7970  
 Tel: 1 808 944 7254  
 Telex: 989171 EWC UD

**INSTITUTE FOR RESEARCH ON  
 ENVIRONMENT AND ECONOMY  
 (IREE)**

Mr. Anthony M. Friend  
 Coordinator of Special Projects  
 Institute for Research on Environment and  
 Economy  
 5 Rue Calixa Lavallée  
 University of Ottawa  
 Ottawa, Ontario  
 K1N 6N5  
 CANADA  
 Fax: 1 613 564 6716  
 Tel: 1 613 564 3313

**THAILAND DEVELOPMENT  
 RESEARCH INSTITUTE  
 (TDRI)**

Ms. Naree Boontharawara  
 Research Fellow  
 Natural Resources & Environment Program  
 Thailand Development Research Institute  
 Rajapark Building  
 163 Asoke Road

72

Bangkok 10110  
THAILAND  
Fax: 662 258 9046  
Tel: 662 258 9012/17 Ext. 174

**WORLD INSTITUTE FOR  
DEVELOPMENT ECONOMICS  
RESEARCH (WIDER)**

Mr. Karl-Göran Mäler  
Director  
Beijer Institute for Ecological Economics  
Royal Swedish Academy of Sciences  
Box 50005  
S 10405 Stockholm  
SWEDEN  
Fax: 46 8 152 464  
Tel: 46 8 160 490/150 430/150 631

**WORLD WIDE FUND FOR NATURE  
(WWF) INTERNATIONAL**

Mr. Fulai Sheng  
Sustainable Resource Use Economist  
World Wide Fund for Nature  
(WWF) International  
CH 1196 Gland  
SWITZERLAND  
Fax: 4122 648219  
Tel: 4122 649111

**INDIVIDUAL EXPERTS**

Ms. Joy E. HECHT

Independent Consultant  
3306 Lorcom Lane  
Arlington, Virginia 22207  
UNITED STATES OF AMERICA  
Fax: 1 703 528 6490  
Tel: 1 703 528 8017

Mr. Mansour KHALID

Senior Advisor to the Executive Director  
United Nations Environment Programme  
P.O. Box 30552  
Nairobi  
KENYA  
Fax: 254 2 226886/226890  
Tel: 254 2 230800/520600

73

Mr. Richard NORGAARD

Energy and Resources Program  
Room 100  
Building T-4  
University of California, Berkeley  
Berkeley, California 94708  
UNITED STATES OF AMERICA  
Home fax: 1 510 548 4815  
Home tel: 1 510 845 5359

## **Annex II**

### **Conclusions and Recommendations of the Workshop**

## **CONCLUSIONS AND RECOMMENDATIONS OF THE CIDIE WORKSHOP ON ENVIRONMENTAL AND NATURAL RESOURCE ACCOUNTING**

### **Conclusions:**

1. Physical databases are important, both for direct monitoring and evaluation of stocks, flows and the state of the environment, and as a prerequisite for valuation. The need for a standardized system for data on the physical environment and its interactions with socioeconomic activities, with international compatibility in data definitions and classifications, as well as with existing SNA classifications, has been clearly identified.
2. The approaches taken to environmental and resource accounting (ERA) will involve a plurality of analytical frameworks and methodologies, designed to monitor sustainable use of natural resources and sustainable income. They will be a catalyst in the development of new databases and research in valuation techniques and depreciation calculations, and provide alternative, although complementary, measures of economic performance.

The approach applied must be consistent with policy objectives. While standardization of the physical and economic databases developed in the resource accounting process will be essential, they must be sufficiently flexible to permit alternative aggregations and analyses.

3. In the next few years, ERA work must include empirical development in using the frameworks, methodologies, and valuation and depreciation techniques in order to test them, determine their feasibility, and assess their usefulness in different countries.
4. Accounting is a formal framework for storing historical data, whereas modeling is a way of expressing the relationships among observed data and projecting them into the future. Models allow us to specify the level of resource use for sustainable development; accounts must then be used to compare current use with the level required for sustainable activity.
5. All accounting methods and models must make explicit their objectives and underlying assumptions, for example, with respect to our preferences for sustainability and the well-being of future generations. The use of discount rates involves a critical assumption about preferences for intergenerational equity and sustainable use of natural resource functions. These assumptions should be recognized and made explicit when any choice is made about discount rates.

6. Techniques and understanding of how to assign monetary values to environmental and natural resources are incomplete and require further research.
7. Aggregate figures such as modified GNP or NNP are important indicators; however, it is the sectoral analysis and data underlying these indicators which will be most useful for decision-making.
8. Models of both the economic impacts of environmental protection and the environmental impacts of economic change and policies should be further developed and their results widely discussed and shared.
9. The organizational and individual users of resource accounts should be active participants in the development and compilation of these accounts so as to ensure that their needs are reflected in the accounts and that they are familiar with the structure and databases of these accounts.

#### **Recommendations for Future Action:**

Techniques for the application of ERA will continue to undergo further development and refinement. However, this should not be used as an argument for inaction. ERA can provide a useful instrument even now for assisting countries to achieve sustainable development. Moreover, the application of ERA should be regarded as an evolutionary process in the development of an effective accounting of the relationship between the economy and the environment.

#### **1. Development Assistance Agencies' Support**

Development assistance, especially that of the Multilateral Development Banks (MDBs), should be allocated to national statistical offices in order to build environmental and resource accounts, fostering cooperation between them and natural resource management and research institutions, and supporting case studies and research. Agencies should also increase their own use of such accounts in resource evaluations, analysis and projections.

A technical assistance programme to establish ERA in developing countries should include the following three parts:

**(a) Research and Training**

The major scientific focus of research and training activities should be on modeling the dynamic processes of environmental stress and response. Major concerns are the identification of key indicators of sustainable development and ecosystem health and monetary valuation of natural resources. Areas for research funding should include, *inter alia*, ecosystem modeling and mapping, human health (*eg.* epidemiological studies), environmental ethics and values, and spatial sampling techniques and methods. Research funding should be directed to universities and research institutes for both basic research and training.

**(b) Technology and Methods**

Technical assistance in technology and methods of information systems should focus on developing the capacity to collect, compile, and disseminate environment and natural resource data. The key elements are: (a) improvement of socio-economic surveys to collect relevant environmental and natural resource statistics, (*eg.* households, industrial establishments, and human health), (b) environmental mapping and GIS technology, (c) development of statistical series from environmental monitoring. The target institutions are central statistical offices, survey and mapping agencies, and departments of environment.

**(c) Environment and Resource Accounting**

The focus is on holistic frameworks and the supporting meta-language of concepts, definitions and classification systems. A major theme is the integration of socioeconomic statistics with biophysical data. The component parts are: (a) stocks and flows of natural resources (NRA), (b) statistics on the state of the environment (SOE) and (c) integrated environmental and economic accounting (*eg.* SEEA).

**2. Information Needs**

A methodology for determining and prioritizing ERA information needs for developing countries should be based on the depletion rates of natural resources. Thus, the first step is to identify the environmental assets for which information is urgently required. The second step is to determine



which parameters of these assets describe the relationship between human activity and environmental change *eg.* agricultural practices and soil erosion. This two-step process will assist in ensuring that ERA systems meet the actual and most important needs for information.

### **3. Handbook**

With much recent work having concentrated on the general SEEA approach developed by the United Nations Statistical Office, serious consideration should be given to using the SEEA *Handbook* as a standard approach to environmental satellite accounting in the SNA. It should be emphasized, however, that this would not exclude the use of other approaches to provide specific information not incorporated in the SEEA and to provide a basis for further revisions of the SEEA.

### **4. Guidelines**

Guidelines for implementing ERA should be formulated, focusing on the following issues:

- (a) Demonstration of the utility of ERA in development planning and monitoring sustainable development objectives;
- (b) Identification of financial, human and technical resources, including data systems, required for ERA;
- (c) Identification of agencies most suitable for the development and application of ERA;
- (d) Formulation of modalities for the integration of ERA into the planning process; and
- (e) Identification of funding sources to support the development of ERA in individual countries.

### **5. Valuation**

The current techniques for physical resource accounting and valuation need to be expanded to include the valuation of environmental services and damages, transboundary pollution pathways, and the environmental impact of international trade. Further research is required in valuing non-market

services. This is an ongoing exercise that should be undertaken parallel to, and in conjunction with, the implementation of ERA.

## **6. Focal Point**

A focal point for information on ERA should be established to document the ongoing world-wide experience in ERA. A major function of this focal point would be to provide information and documentation on ERA on request. Such a focal point could even publish a manual detailing existing techniques in ERA (particularly with regard to physical accounting and valuation). This manual would be constantly updated based on the results of ongoing applications and research. The Workshop recognized that this function could be performed by UNEP, and possibly located within the CIDIE Secretariat.

## **7. UNEP/UN Statistical Office Joint Activities**

The following were proposed as possible joint activities between UNEP and the UN Statistical Office, as well as any other interested agencies:

### **Natural Resource and Environmental Accounting**

- (a) The development and analysis of valuation techniques and their implications for formulating and monitoring policies of sustainable economic growth and development through the use of individual and collective expertise;
- (b) The organization of international or regional seminars and workshops on natural resource and integrated environmental/economic accounting, based on international methodologies (notably the SNA Handbook on Integrated Environmental and Economic Accounts), with support for developing countries' participation in such seminars or workshops;
- (c) The use of environmentally-adjusted indicators and aggregates in integrated socioeconomic and environmental development (sustainable economic growth and development) through national pilot projects, workshops, or expert groups;

**Environmental Statistics and Indicators**

- (d) The promotion and application of methodologies, including data uses for integrated environmental and socio-economic management and policies, through workshops and seminars at the level of regional commissions and other regions such as the Mediterranean;
- (e) Data collection in collaboration with other international organizations through the Intersecretariat Working Group on Environmental Data (use of "lead" databases);
- (f) In recognition of the recommendations of the Intergovernmental Working Group on the Advancement of Environmental Statistics (Arusha, February 1992), the preparation of:
  - a glossary of terms of environmental statistics, and
  - an inventory of training facilities in environmental statistics and accounting.