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REPORT OF THE WORK SESSION ON METHODOLOGICAL ISSUES OF ENVIRONMENT STATISTICS

Note prepared by the secretariat

1. The joint ECE/Eurostat Work Session on Methodological Issues of Environment Statistics was held in Ottawa (Canada) from 1 to 4 October 2001, at the invitation of Statistics Canada. It was attended by representatives from Austria, Canada, Denmark, Estonia, Finland, France, Germany, Hungary, Israel, Italy, Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States and Yugoslavia.

2. The meeting was also attended by representatives of the European Environment Agency (EEA), the European Topic Centre on Waste and Material Flows, the Food and Agriculture Organisation (FAO), the United Nations Statistics Division (UNSD), WHO-ECEH and WHO-PAHO Collaborating Center on Environmental and Occupational Health Impact Assessment and Surveillance.

3. Representatives of Carole Burnham Consulting, the Center for Risk Management - Resources for the Future and World Systems Europe were also present at the invitation of the Secretariat.

4. The opening session was chaired by Mr. Claude Simard, Director of Statistics Canada's Environment Accounts and Statistics Division. A keynote address was delivered to the meeting by Mr. Philip Smith, Statistics Canada's Assistant Chief Statistician. He mentioned, in particular, two specific initiatives, namely: the development of environment and SD indicators aimed at testing and developing a set of nationally recognized set of indicators, and the creation of a task force on the Canadian Information System for the Environment. Representatives from UNECE, Eurostat and Statistics Canada also addressed the meeting, briefly presenting the expectations of the respective organisations concerning the Work Session. Mr. Claude Simard concluded the opening session by presenting an update on the work of Statistics Canada's Environment Accounts and Statistics Division.

5. The over-arching topic of the Work Session was "Environment indicators and development of indicators of sustainable development". The discussion was subdivided into six sessions each focussed on a different topic and chaired by different persons:

- Session I: Recent experiences in compilation of indicators of sustainable development
  (Chaired by Gene Nyberg, Canada, NRTEE)
- Session II: Sustainable development indicators, concepts and frameworks
  (Chaired by John Custance, UK, DEFRA)
- Session III: Eco-efficiency indicators
  (Chaired by Maila Puolamaa, UNSD)
- Session IV: Water indicators
  (Chaired by Isabella Pierantoni, Italy, ISTAT)
- Session V: Waste indicators
  (Chaired by Svein Homstvedt, Norway, Statistics Norway)
- Session VI: Indicators of environment and health
  (Chaired by Lene Mikkelsen, UNECE)

6. The topics were discussed on the basis of 32 Working Papers prepared by Australia, Austria, Azerbaijan, Belgium, Canada, Denmark, Estonia, Finland, Germany, Hungary, Israel, Italy, Netherlands, Spain, Sweden, Switzerland, United Kingdom, Eurostat, EEA, European Topic Centre on Waste and Material Flows, FAO, UNCSD, UNECE, UNSD, WHO-ECEH and WHO-PAHO. Additional written material submitted by Kyrgyzstan served as a supplementary basis for discussion.

7. All countries papers submitted to the Work Session are available for downloading from the UNECE Statistical Division's website at the following address:

http://www.unece.org/stats/documents/2001.10.env.htm

8. The papers and discussions highlighted the fact that sustainable development means economic and social development, as well as environmental issues, and that development work needs to involve

economic, social and environmental statisticians as well as policy makers. The importance of communicating the results and getting feedback from the audience was also emphasised.

9. The participants were informed of the work undertaken in Canada to provide decision-makers, opinion leaders and the Canadian public with advice for promoting sustainable development. In this connection, another keynote address was delivered by Mr. Stuart Smith, Chairman of the National Round Table on the Environment and the Economy. He stressed the importance of developing indicators of sustainable development which were simple, robust and non-controversial.

10. In the final session, chaired by Mr. David Berry (USA, Department of Interior), the meeting discussed what role statisticians could or should play in the development of indicators and frameworks for different government programs.

11. The Work Session would like to call the attention of the Conference of European Statisticians to a general conclusion which was supported throughout the meeting: that statisticians need to be involved in the early stages of the work to identify and develop sustainable development indicators to add practicality to the mix of ideas, to help clarify ideas and to advise on the feasibility of any indicators proposed and the potential costs involved. This new and increasing demand for indicators of sustainable development is an opportunity for Statistical Offices to build public, political and financial support for their work.

12. Concerning the topics to be discussed at future meetings, the participants recommended that another meeting take place in two years to discuss the following topics:

1. Linking Environmental Statistics to Environmental Accounts

Explore issues on developing environmental statistics that are needed to complete environmental accounts. At this session, the need to co-ordinate the standardization of terminology through classification systems, for example, has been identified. Some of the sessions could examine the following:

- Classification systems of environmental statistics that are consistent with those of environmental accounts (consistency of terminology between the accounts and underlying statistics, and vice versus)
- Use of spatial units (and GIS applications) in developing certain environmental accounts (e.g., water accounts reported by water drainage basins or capture basins)
- Development of environmental surveys and questionnaires and administrative data to collect data for the environmental accounts
- Use a few specific case examples/environmental accounts: water accounts, material and energy flow accounts, ecosystems, land and soil

2. Keeping up the momentum of Jo'berg 2002

- Building on work done by countries and international organisations for the 2002 World Summit and beyond
- Exploring statistics covering the interface between the Social and Environmental Dimensions of Sustainable Development (i.e., linkages between environment, poverty, trade and human security; improving governance and democratic processes at all levels; financing Sustainable Development through domestic resources, trade and foreign direct investment)
- Other topics from Jo'berg 2002

3. Environment, Transport and Tourism

Country and international organisation's experiences in producing indicators and information reflecting the integration of the environment into policies for sustainable transport and sustainable tourism.

13. Each of these topics could include examples of more technical topics, such as use of GIS, use of administrative data, extrapolation to drainage basins or other geographical breakdowns, etc.

14. There was support for all of the topics, though it was generally felt that the next work session should focus on only one. The single theme format of this work session had raised the quality of this compared to previous work sessions. As countries generally send only one delegate, a single theme makes it easier for countries to identify the correct participant, and to derive the maximum benefit from the work sessions. From this point of view the accounting topic could potentially require the participation of a large number of delegates from each country. If several of the different environmental accounts e.g. air, water, forests, are to be covered, the London Group may be a better forum for this.

15. In general the delegates felt that the present length of these work sessions was about right, allowing the topics to be discussed properly, ideas to be exchanged and useful contacts to be made.

16. The participants were unanimous in their appreciation of the excellent organisation of the meeting, the social activities and the excursions offered by the Canadian hosts.

17. The meeting also thanked session organisers, discussants and authors of papers for the excellent work.

18. The main conclusions reached by the meeting are presented in English only in summary form in Annex to this note.

19. The participants adopted the report of the meeting at its closing session.

Annex

Summary of the main points discussed by the participants at the Work Session on Methodological Issues of Environment Statistics

Session I. Recent experiences in compilation of sustainable development indicators

1. Documentation:

WP 22: "UK experience in developing sustainable development indicators", John Custance, UK
WP 6: "Sustainable development indicators for Sweden", Lena Tängden, Sweden
WP 31: "Sustainable development indicators for Switzerland", Peter Glauser, Switzerland
WP 16: "Sustainability indicators in urban areas", Gabriella Donatiello, Italy
WP 15: "Recent experience in compilation of indicators of sustainable development", Kyrgyzstan
CRP 1: "Development of headline sustainability indicators in Australia," Bob Harrison, Australia

2. The session's chairperson was Gene Nyberg, corporate secretary of Canada's National Round Table on the Environment and the Economy (NRTEE).

3. John Custance reported on the UK experience in the compilation of sustainable development (SD) indicators. Following the three pillars of sustainability - environment, economic, and social dimensions - the UK published its first set of 120 sustainable development indicators in 1996. In 1999, a second, substantially revised, set of about 150 indicators was published. One key component of the new indicators is a small subset of 15 "headline" indicators. These headline indicators intend to focus public attention on what sustainable development means and to give a broad overview of whether "a better quality of life for everyone, now and for generations to come" is, indeed, being achieved. In his presentation, Mr. Custance emphasized that in the UK indicators and SD issues are driving the agenda forward. In general, there has been a "buy-in" from other government departments. He stressed the importance of a wide consultation process, which in their case comprised national seminars, advisory groups, and focus groups. Of primary importance in the development of selection criteria was that the SD indicator should be issue-led and not data-led. The original request was to have only 6 national-level headline indicators - something to focus the public attention on sustainable development. Finally they managed to get approval for 15 headline indicators. In terms of local indicators, there were 20 to 30 indicators launched in the summer of 2000. These were a result of consultations with local groups,

where social issues come to the fore (crime, transport, social cohesion, health, etc.). These indicators will have to be incorporated in the overall set of indicators.

4. In the general discussion which followed, Mr. Custance explained the UK's success in terms of their efforts to influence public opinion and by having the support of ministers (for example, doing special stories and getting involved in the publicity for various strategies). Another strategy that worked well, was "sowing" local stories that would go out at the same time as the national indicators. Having the indicators published by an independent agency, as suggested by one of the participants, may have gotten more acceptance in some areas but it would have been more controversial, overall.

5. Lena Tängden presented the compilation of the first set of Swedish SD indicators. In cooperation with the Swedish Environmental Protection Agency, Statistics Sweden developed 30 SD indicators which were published in May 2001. These indicators were organised under four themes, namely, *Efficiency*, *Equality/Participation*, *Adaptability* and *Values and Resources for Coming Generations*. Similar to the UK approach, the Swedish indicators also encompassed economic, environmental and social dimensions of sustainability. The results showed that Sweden experienced improved performance in areas such as making better cars with less fuel consumption and less emissions. However, the performance was not as good in terms of making sustainable choices, as witnessed by more cars with higher performance and travelling more by car.

6. In the discussion it was noted that the Swedish framework went a step beyond balancing the three forms of capital. For example, eco-efficiency was shown as an important lever in SD indicators. However, the framework could be improved by looking at indicators that fall between environmental and social fields (ratio of jobs to environment and where that is moving, for instance). In addition, it would be worthwhile looking more closely into waste per value added—specifically, at the level of eco-efficiency so that total waste would be reduced. It was also suggested that the mid-term target of decoupling waste from economic growth should take into account the change in the composition of industries, particularly in manufacturing industries (the emergence of more light industries such as electronics). There is, thus, the need to split up the industries into their specific component industries. Otherwise, the indicators will simply reflect different economic/environmental trends.

7. The paper's overall conclusion that Sweden is not SD for the time being seemed to be a relatively strong conclusion for a statistical agency to draw. This raised the question of *how far should statisticians go in terms of conclusions and what kind of discussions should the agency have with other authorities after the publication of the report?*

8. Peter Glauser presented MONET, Switzerland's project aimed at Monitoring Sustainable Development. The indicators would provide relevant information on trends in social, economic and

environmental aspects of Switzerland's development. In addition, they could be used to gauge Switzerland's SD position against other countries. Mr. Glauser highlighted the rationale behind the project, the process involved, and the 26 areas in the MONET list of topics. The initial results of the project will be published in time for the World Summit on Sustainable Development (Rio+10) in 2002.

9. Gabriella Donatiello described Istat's experience in developing urban environmental indicators for major cities of Italy. The report also looked at some underlying issues in the development of urban sustainability indicators. The Driving Forces-Pressures-State-Impact-Responses model was the chosen analytic framework. A provisional list of urban environmental sustainability indicators was presented.

10. The discussion that followed raised the question of quantifying indicators from the point of view of expenditures (for example, how much do municipalities spend?). The Istat survey does not collect data on expenditures at this level as the aim was to improve the environmental statistics at the national level.

11. A comment was made on the difficulty of using the population figures as a denominator in urban areas, as commuters, not included in the urban population, also have an impact on the urban environment. Actual population numbers may be different from those provided by administrative registers. An alternative approach could be based on employment figures (i.e., the number of people employed in cities).

12. Another comment was directed toward the "ranking" of cities as a result of the published results. The data were not meant to be used for ranking purposes or calculating environmental performance of cities but the newspapers may have their own ideas in using the data. It was noted that it is important for the city data to be used for comparison in order to achieve better environmental performance (for example, Italian NGOs tend to use the data, create an index and push the cities to "compete" against each other).

13. Gene Nyberg summarized the discussions and the key issues raised throughout the session. He noted some of the commonalties among the approaches and frameworks used by the different countries—for example, in trying to be inter-disciplinary and practical. The "practical" aspect poses a challenge to environmental statisticians and there are internal debates among the concerned groups about how GDP should be qualified in order to give a relevant measure together with various social considerations that need to be looked at. Thus, there is a need to root the indicator work in public consultation in order to be "tuned in" on what the political and social relevance of the indicators would be.

Session II. Sustainable development indicators, concepts and frameworks

14. Documentation:

WP 9: "A proposed approach to sustainable development based on capital", Alice Born, Canada
WP 27: "The CSD work programme on indicators of sustainable development", UNCSD, presented by Anne Kerr, Environment Canada
WP 23: "FAO Handbook and links to sustainable development indicators", Pratap Narain, FAO
WP 21: "Agri-environmental indicators to describe agriculture sustainability", Giampaola Bellini, Italy
WP 26: "Key indicators for sustainable development", Mario Ronconi, Eurostat
WP 5: "The EEA focuses on EU-policy in its approach to SD development indicators", Peter Bosch, EEA

15. The session's Chairperson was John Custance, Chief Statistician of the UK Department for Environment, Food & Rural Affairs (DEFRA). There were two discussants: Anne Kerr of Environment Canada and David Berry of the US Department of the Interior.

16. Alice Born, in presenting the paper from Statistics Canada, told the Work Session that the purpose of their work is to provide a conceptual framework for the establishment of sustainable development indicators centred on the concept of capital and focused on the economy as the object of sustainability. The concept of capital was chosen because it aligns very well with the temporal aspect of sustainable development. The paper included sections on the conditions for economic sustainability, the primary factors of production (labour, produced capital, natural resources and land), the relation of capital to sustainability and various measurement issues. The final section was dedicated to the presentation of a potential set of sustainable development indicators based on the concept of capital.

17. The discussant for the first two papers from Statistics Canada and the UN Commission on Sustainable Development (CSD) was Anne Kerr. Her discussion focused on the definition of sustainable development adopted by the two approaches and on the list of indicators that have been derived from each of the approaches. The capital approach presented by Canada focused on the economy as the object of sustainability whereas the CSD's approach is looking at the society in general and the three pillars of sustainable development. The capital approach is still at the theoretical level, while the CSD work programme on indicators of sustainable development has been extensively discussed and tested and has identified a set of indicators to be used by many countries.

18. The indicators derived from the two approaches are similar even if the approaches are conceptually different. In the opinion of the discussant, one needs to make sure that it is worthwhile to invest time and effort in the development and the international acceptance of the capital approach if the

indicators derived from that approach are closely related with the ones already developed through the CSD work program. A suggestion is that the capital approach may help to refine some indicators of the CSD list of sustainable development indicators.

19. The participant from FAO described a new Handbook which reviews existing work in the field of agri-environmental indicators and proposes a list to initiate the work. However, the focus of the Handbook is on collection of data and therefore part of the Handbook is devoted to statistical techniques and concepts and definitions that are useful for collecting data for compiling the indicators.

20. The Italian paper also dealt with sustainable agriculture, presenting their work on indicators related to agricultural practices, with data collected through the regular farm structure survey. Such indicators can be used to monitor progress towards sustainability, showing whether sustainable production systems are applied in the field.

21. In the general discussion which followed, it was noted that the capital approach presented by Canada is in line with the System of Environmental and Economic Accounting (SEEA) under revision by the London Group. It is important, however, that further conceptual framework development is taking place, such as the capital approach.

22. The representative from the UK felt that the PSR framework works well for dealing with environmental issues; however it is not suitable for sustainable development issues. He thought it unlikely that only one accepted approach (framework) would be agreed at international level. There is room for different approaches that do not compete with each other.

23. It was further noted that the capital (i.e. stock of natural resources, ecosystem services and land) found in a country is not only influenced by specific factors within a country but also by what is happening in its surrounding neighbours and around the world. This needs to be also incorporated into the capital approach.

24. One participant thought that a broader definition of SD was needed than the one used in the capital approach. Another stated that the capital approach is well suited to look at the capacity of future generations to meet their needs. Despite these divergences, the meeting agreed that the capital approach is very interesting. The underlying assumption is that the capital would have to be kept constant over time through the introduction of the substitution concept. In other words, what matters is that the reservoir of resources is not depleted.

25. In summarising progress on sustainability in the EU, Mario Ronconi (Eurostat) presented current projects and results, such as the 2001 SD indicator Report, drawing upon the UNCSD core list of SDI, and the forthcoming work on methodological issues (analysing/developing appropriate frameworks and indicators for statistical work on SD), in order to identify a common approach at European Union level, where suitable. Eurostat pointed out that policy conclusions cannot be derived from a purely statistical report, but that a strong statistical basis and the availability of statistical information on sustainability issues and themes are both essential pre-requisites for elaborating comprehensive and meaningful indicators and thus for assessing policy. The latest policy developments were also reported to the meeting, i.e. the Göteborg European Council of Heads of State, held in June 2001, which agreed a strategy for sustainable development to complete the Union's political commitment to economic and social renewal, by adding a third, environmental dimension, thus establishing a new co-ordinated approach to policy making. As a first step, the European Council singled out a number of objectives and measures as general guidance for future policy development in four priority areas: climate change, transport, public health and natural resources.

26. The representative from the European Environment Agency (EEA) told the meeting that they produce assessments based on (environmental) indicators to support policy. With the publication of the Sustainable Development Strategy for the European Union, and the European Commissions' intention to publish a progress report on sustainable development for the prime ministers each year in spring, the EEA will become involved in regular assessments of progress in the environment within the context of sustainable development.

27. The discussant for the second part of the session was David Berry (United States), who drew the following conclusions: a lot of work has been done since the first meetings took place on defining environmental and sustainable development indicators. Many alternative frameworks have been proposed and discussed as well during that period. There are many similarities in the papers presented during this session. Is this the start of a convergence to a common framework? Eurostat's paper highlighted the importance of a strategy for sustainable development. Whatever framework is chosen/developed, the framework must remain flexible and open. A sustainable development framework has two characteristics: it needs to be linked to a statistical system and to policy issues. He suggested adding a third one: it needs to be linked to our best science, and so we need to bring on board a new partner.

28. In the general discussion, support was voiced for the idea that an indicator should have a good link to solid science, as indicators of sustainability are complex and one should remember that they are not innocent. In deriving indicators, there is always the danger to focus only on what is popular to politicians at a given time (e.g., reduce individual transport). It is possible to be policy relevant by

having indicators that excite the public and/or indicators that connect to the policy analysis; both sides should be considered since diversity is good.

29. The Chair concluded the session by pointing out that the key is to integrate environmental concerns into policies. The entire process of developing indicators is also very important and a framework for organizing the selection and development of indicators is essential. Ultimately, the choice of a framework and a core set of indicators must meet the need and priorities of those responsible for monitoring progress towards sustainable development.

Session III. Eco-efficiency indicators

30. Documentation:

"Calculating Eco-efficiency Indicators: A Workbook for Industry", Carole Burnham, National Round Table on the Environment and the Economy (Canada)
WP 2: "Eco-efficiency indicators in German environmental economic accounting", Steffen Seibel, Germany
WP 10: "Eco-efficiency indicators as a step to indicators of sustainable development", Ingeborg Fiala, Austria
WP 30: "Efficiency: the sustainability criterion that provides useful guidance for statistical research", Luisa Sanches, World Systems Europe

31. The session was chaired by Maila Puolamaa, of the United Nations Statistics Division, with Svein Homstvedt (Norway) and Kaia Oras (Estonia) acting as discussants.

32. In her opening remarks, Ms. Puolamaa emphasized the currently high level of demand for work in the eco-efficiency field and added that many countries have experience in this field.

33. Carole Burnham from Canada's National Round Table on the Environment and the Economy presented pertinent highlights from the new publication entitled "Calculating Eco-efficiency Indicators: A Workbook for Industry." Ms. Burnham explained that the term "eco-efficiency" has been used because it relates better to the business concept of efficiency. However, eco-efficiency is only one of the tools that could be used for SD indicators. In Canada, indicators are already being used by some companies, which is why setting a standard approach is becoming more important, as it would provide a common ground for comparison. The hope is that with wide use, these reporting methods would become as standard as financial statements.

Ms. Burnham described the project framework which included the participation of 12 volunteer companies selected from a wide range of manufacturing industries. The eco-efficiency indicator was defined as a ratio of environmental burden over the unit of production or service delivery. She then provided a brief description of the major research findings which included the following:

- There were difficulties in finding a common denominator to be used by companies. Examples of possible common denominators may include weight, number of units, megawatt hours, dollars of sales, etc.
- There are various ways of calculating indicators of intensity, depending on the company.
- The companies were very cautious about communicating the levels and successes of the indicators to the general public.

34. Steffan Seibel presented the framework and methodology behind the calculation of eco-efficiency indicators in German environmental economic accounting. Mr. Seibel noted the two different aspects as to how the economy deals with nature: how much "nature" is used absolutely (sufficiency aspect) and how much "nature" is used in relation to what is produced with its help (efficiency aspect).

35. Mr. Seibel described two measures of efficiency: intensity - how much "environment" is needed to create a unit of economic output - and productivity - nature to be considered a factor of production; treating environmental inputs the same way as economic inputs. One major conclusion that could be derived from the research was that productivities are better in measuring eco-efficiency. Productivities, however, cannot be compared to each other directly. Rather, one must look at the productivity trends. Presently, headline indicators are set up for the German Environmental Barometer.

36. Svein Homstvedt discussed the first two papers. Mr. Homstvedt stressed the importance of communicating concepts such as eco-efficiency to the general public in a simple, easy to understand manner. He noted that currently the concept of indicators has become very complex and in some cases, only the experts can understand the message.

37. Mr. Homstvedt also provided some comparisons based on the Norway's experience in eco-efficiency reporting. He indicated that in Norway, many companies report in the same manner as described in
Ms. Burnham's report, but it is not mandatory and hence, the reporting is not standardised.
Mr. Homstvedt went on to summarize the findings of the German research paper. He pointed out the importance of the conclusions based on the German paper but also indicated the complex task of conveying the message to the general public.

38. In the general discussion, the question was raised whether it is possible to incorporate the use of environmentally-friendly energy (or water) in the calculation of eco-efficiency and to create an incentive

to the use of environmentally-friendly sources. Ms. Burnham responded that this issue is addressed if the company is generating energy on its own property (via wind or solar technology, for example). However, if the energy is coming from the outside, a complementary efficiency indicator may be needed. This would be complicated because different areas have different balances of power sources. The suggestion, therefore, is to address these types of complementary indicators after the initial indicator work become more refined.

39. Did the businesses have access to the information on other companies or was confidentiality preserved? Ms. Burnham noted that the numbers were not used to compare the companies. In terms of the German study, one of the comments was that a lot of the change in Germany may be due to structural effects which tend to be very difficult to communicate to the public.

40. Luisa Sanches provided an overview of what eco-efficiency indicators are and how to design them, focussing on the three dimensions of sustainability – ecological, economic and social. She also pointed out how conflicts can be expected between economic efficiency and economic sustainability. Currently, the three dimensions of sustainability are being segregated into separate units whereby too many separate indicators can be designed but not those that are contained in the overlaps of the three dimensions. Using the meso-level approach, the project was aimed at designing indicators that could be used as a tool in the decision-making process. Ms. Sanches explained the advantage in using sectoral-oriented indicators and provided some examples of the application of ratios on a sectoral basis.

41. Ingeborg Fiala presented the Austrian eco-efficiency indicator framework which was based on the chosen themes—national economy, municipal waste and energy and the chosen sectors—agriculture and forestry, industry and transport. Ms. Fiala explained various data limitations as well as some inherent deficiencies of the eco-efficiency concept, including technological innovation's perceived effect of decreasing environmental burden; the rebound effect—improvement in efficiency may save money for consumers which, in turn, can be spent on other things or replace things more often than they would have been in the absence of the technology; and totals used in the material or energy accounts—adding tonnes of different materials may not necessarily make sense and totals are heavily influenced by large-sector streams. She also put forth a proposal to broaden the eco-efficiency concept by looking at eco-efficiency as the value provided, divided by the environmental burden imposed.

42. Kaia Oras provided some comments on the two preceding papers. Ms. Oras agreed that broadening the eco-efficiency concept is a good idea in order to take the impact of activities into account. She indicated, however, that looking at the impact by sector could be confusing because the effect of an activity may be sectorally cross-cutting. She emphasized the need to keep the concepts fairly simple in order to aid in comprehension.

43. The discussion brought forth the need for the data on indirect impacts. It was also suggested to model indirect impacts through the use of input/output tables in environmental accounts. The problem of eco-efficiency and sustainability between generations was also raised — whom are we making the indicators for? Eco-efficiency belongs to the concept of sustainability in the class of an indicator of response.

44. Ms. Puolamaa provided a summary of conclusions for the session. She pointed out the importance of communication during the development process, the need to address the question of data aggregation and the advantages of relating indicators to efficiency targets.

Session IV. Water indicators

45. Documentation:

WP 4: "Towards the application of the international water-related environmental indicators in Hungary", Pál Aujeszky, Hungary
WP 12: "Water indicators and data needs: revision of the Joint OECD/Eurostat questionnaire on water resources, abstraction and use", Rosemary Montgomery, Eurostat
WP 13: "The revision of the Joint Questionnaire section on Inland Waters: Improving data collection on wastewater-related issues," Kees Baas, Netherlands
WP 34: "Water resource accounts", Alessandra Alfieri and Ilaria Di Matteo, UNSD
WP 11: "Water accounts in Spain," Fátima Escribano Morales, Spain
WP 25: "Statistics on water resources by country in FAO's AQUASTAT Programme," Jean-Marc Faurès, FAO

46. The session was chaired by Isabella Pierantoni (Italy), while the discussants were Sylvie Detoc (France) and François Soulard (Canada).

47. The first paper was presented by Pal Aujeszky (Hungary) and provided an overview on the implementation in Hungary of the water-related environmental indicators developed by the international organizations (Eurostat, EEA and OECD). In 1996 the Hungarian government set up the Integrated Environmental and Economic Information System, aimed at producing environmental statistics (including water management statistics) meeting the international standards. A survey was also carried out on the application of water related environmental indicators based on the methodology developed by the international institutions. The first results of the survey showed that the international water related indicators are cost effective and powerful tools for describing environmental progress and measuring

environmental performance. However, further efforts should be made to: improve the quality and comparability of existing data; develop concepts and estimation methods; cover the sectoral water related indicators (industry, energy, agriculture, tourism); and link the indicators more closely to national goals and international commitments.

48. The second paper, on the revision of the bi-annual Joint OECD/Eurostat questionnaire on inland waters, was presented by Rosemary Montgomery (Eurostat). Response to the questionnaire over the years has been poor, often with more gaps than data, and definitions and methods used have led to major differences between countries which render the data impossible to compare or to aggregate in useful ways. It was therefore decided to revise the whole reporting system and a task force was set up in 1999 to propose a revision of the questionnaire. Ms. Montgomery described the issues discussed during the revision process and presented the results of the work to revise the first three tables of the questionnaire, on water resources, abstractions and uses of water.

49. The paper presented by Kees Baas (Netherlands) dealt with the revision of the sections on waste water discharges and treatment in the Joint OECD/Eurostat Questionnaire on Inland Waters. The changes and modifications proposed are aimed at a simplification of the requested data as well as a harmonisation with the concepts and definitions of the European Urban Waste Water Treatment Directive (UWWTD). The use of new definitions and terminology on waste water, according to the UWWT Directive, was proposed. Also a new classification of waste water treatment plants, based on treatment efficiencies instead of technical criteria, was part of the revision of the tables. Furthermore, the data collection on the origin and destination of discharged pollution was restructured according to a new waste water loading scheme.

50. The discussant for the first three papers was Sylvie Detoc (France). She highlighted three aspects from colleagues' papers. The first aspect was a technical one, associated with the development of a new questionnaire and the need that the revision brings real improvements. She noted that the harmonization of terminology and concepts is a significant progress and that the reporting burden is lightened. The new questionnaire takes into account the specificities of some countries and the possibility of giving regional information. She observed that tourism should also be taken into account: the JQ doesn't include questions on the seasonal population and perhaps it should, since tourism places an important burden on water resources and waste water treatment facilities.

51. The second aspect discussed by Ms. Detoc concerned the organization of a system of data collection. The example of Hungary - though it was very complete - was characteristic of the difficulty of collecting all the data to build a perfect set of water indicators. European or international initiatives are good opportunities to implement monitoring networks, to make surveys, to achieve water

databases, and to develop methodological work in the field of indicators. However, even with new and more appropriate methods, there will always be some difficulties. For instance, it will be difficult to get harmonized data from river basin levels in France, as the French water system is decentralized.

52. The third aspect was the question of the target audience: How to compile data, for which public: experts, stakeholders, newspapers, general public? We need to have consistent, coherent, aggregated indicators to describe clearly the level of water quality as well as the quantity of water. The water framework directive includes an obligation on making information public: this should be relevant for policy makers but also understandable for the general public. We need to have more adequate tools, for instance something very aggregated such as a water index.

53. The open discussion that followed touched several issues. Many participants agreed that reporting should be by drainage basins instead of by political boundaries. In some cases, however, it is not easy to make the link between administrative level and natural level. The French representative observed that her country has a long experience with river basin management. Connecting economic with physical data is not a real problem if you have good geographic information, a good information system (GIS) and if you know where extraction and discharge areas are.

54. Israel observed that the JQ does not address the problem of salinity, which is a very important issue in her country. EEA replied that there are other member countries that face salinity intrusion into water and that the EEA addresses the water quality issues, including parameters on chloride in groundwater.

55. Alessandra Alfieri, of the United Nations Statistics Division, presented a paper on Water Resources Accounts in the SEEA. The main idea of the accounts is compiling the hydrological information with the economic information. Agenda 21 called for an integrated approach to water management, which requires an integrated information system. Water accounting is proposed as a tool for monitoring progress toward meeting environment goals, assisting in the formulation and evaluation of policies, and improving policy dialogue among various groups. Water accounting can be defined as flow and stock accounts that integrate hydrological and economic information in a framework consistent with the System of National Accounts. Ms. Alfieri described the various water accounts modules and the relative indicators. She also presented some of the open issues. For instance, since water resources depend heavily on the seasonality or water cycle, should we develop seasonal accounts or annual accounts? How do we include in annual accounts much longer cycles? The future work in the field of water accounts includes areas such as: coordination/terminology, water valuation, transboundary water and indicators.

56. The last paper of this session was presented by Fatima Escribano Morales (Spain) and dealt with water accounts in Spain. The paper presented the main results of the 1999 water satellite accounts, based on the NAMEA methodology. They describe the monetary flows of economic activities concerned with water and the non-monetary flows, whether quantitative or qualitative, of water. The paper also includes a discussion on the production units and a description of the estimation methods, which include: irrigation systems; water abstraction, depuration and supply; Public Administration Services; and services of waste water treatment.

57. The discussant for the second part of the session, Francois Soulard (Canada), referred to a supporting paper on the Italian experience on surveying water statistics, submitted by ISTAT. This paper argues that the processes of defining a conceptual framework of indicators and of collecting data are not independent: theoretical definition of an indicator must drive the effort of production of requested information. Mr. Soulard observed that a survey cannot inquire about the actual renewability of water, and actual water quantities. We often only look at water flows and forget stocks; and we often mistake flow for stock.

58. Mr. Soulard congratulated the UNSD on the huge amount of work in the sphere of natural resource accounting covered by their paper. He suggested to add to the paper a section on the categorisation of water and argued that an asset table could be added to allow for surface and ground water to further be broken down in surface river/lake, shallow/deep aquifer, fresh/brackish, renewable/fossil, internationally shared (or not) ground or surface catchment area, etc. He also felt that the sustainability issue was not appropriately dealt with - the definition classified all water held in reservoirs and dams as unsustainable.

59. The paper from Spain was welcomed as very straightforward, non-theoretical - a good demonstration of the application of the concepts of water flow accounting. Water accounts is a topic that needs to be looked at from the innovative and from the pragmatic side. Given the complexity of the interaction within the hydrosphere, he observed, we need a model that allows us to simplify it enough to meet the relatively straightforward information produced by the SNA. The water balance is such an approach. However, the water balance approach does nothing to help define what water sustainability is.

60. The discussant's conclusion was that we still need sound frameworks that prevent decision-makers from misinterpreting what we are saying and by posing some questions: Do we need an integrated system of economic and environmental accounts? Are national accounts appropriate? Should we not be talking about watershed accounts, or better yet, continental accounts? Are environment accounts always the best tool to deal with sustainability?

61. The discussion on water accounts was very lively and covered several aspects. The Norwegian representative observed that some additional issues could be included in the accounts, including hydro-electric power or the relationship between water resources (lakes, rivers, bogs, creeks, etc.) and recreational activities.

62. The representative from FAO noted that the national accounts are based on tangible economic concepts integrated into a framework. In the field of environment, he argued, concepts are not that tangible today, therefore they should be studied at a disaggregated level.

Session V. Waste indicators

63. Documentation:

WP 29: "Status and future expectations for the Headline Indicators on Waste for the European Community", Mario Ronconi, Eurostat
WP 33: "Challenges in development of indicators on hazardous waste", Jens Brodersen, The European Topic Centre on Waste and Material Flows
WP 32: "Waste from production and consumption. How to meet the indicator needs. Experiences from Finland", Simo Vahvelainen, Finland
WP 17: "Indirect methods used for waste statistics and waste indicators", Ruth Sheshinski, Israel

64. The session was chaired by Svein Homstvedt (Norway), while each of the four authors acted as discussant of one of the other papers presented in the session.

65. The focus of the session was the environmental problems associated with waste. The issues discussed include toxic sources, emissions to air and water, soil degradation, sub-optimal use of resources, occupation of land, smell and inconvenience, logistics and transport, product efficiency, symbol for a decadent society. A review of the waste hierarchy touched on how to measure waste prevention, reuse, material recovery, composting, incineration with and without energy recovery, and landfill.

66. The first presentation given by Mr. Mario Ronconi (Eurostat) touched on the problems of definition and classification of waste statistics. Other issues raised were the fact that the term municipal waste is being dropped, that decisions about waste policy are made at the local level and not the central level, and that it is difficult and not so useful to have annual data on waste generation. The goal is to have sustainable waste management, not necessarily a reduction in volumes. As such it would be more useful

to have annual numbers on waste treatment. Mr. Ronconi compared the UN and Eurostat`s lists of waste indicators. The lessons learned are that significant information has been aggregated but with poor statistical bases and that there is a trade off between being statistically correct (using only reliable data) and being politically acceptable (using whatever data are available). Mr. Jens Brodersen (The European Topic Center on Waste and Material Flows) led the discussion for this paper. He raised three main problems. The first problem is waste definition. For example municipal waste internationally has two definitions, one by the type of collection and one by the type of waste. The same is true for hazardous waste. The second problem is the distinction between waste and a by-product. The final problem he raised was the patchwork of different reporting obligations for data collection and definitions. The discussion was followed by a question session. One of the questions concerned the difficulty in obtaining data on the import and export of waste.

67. The second presentation was by Mr. Brodersen. The objective of his paper was to derive indicators for EU waste management policy and proposed core indicators for waste. Ms. Montgomery (Eurostat) led the discussion session for this paper. She brought up the difficulties involved in developing hazardous waste indicators. Problems discussed included difficulties with defining hazardous waste and the differences between the EU countries, data prior to the waste statistics regulation are generally very poor, and the lack of a common standard for the different treatment options. Ms. Montgomery also raised concerns over the value of statistic of hazardous waste generated per employee, and what message it sends. She expressed that waste aggregation according to type of toxicity would be meaningful, but recognized that to do this would be almost impossible. A representative from Statistics Canada questioned the differences in reporting requirements and confidentiality issues between Canada and the EU countries. WHO mentioned that hazardous waste has been classified along health criteria.

68. The third presentation, given by Mr. Simo Vahvelainen (Finland), was on industrial and consumption waste. Statistics Finland has a collection of waste statistics which has been undertaken for almost 20 years. The discussant for this paper was Ms. Ruth Sheshinski (Israel). She called for more detailed definitions as to what is included in industrial and consumption wastes. In her opinion, although the data are not perfect for the creation of indicators, it was important to use and publish them for discussion and debate. She indicated that the totals are usually good for indicating trends as long as we make sure that the denominator we use is relevant. Housing trends are interesting, but household income might be a better variable. The question of landfills and the availability of land were raised. In some countries the scarcity of land is leading to further deterioration of available land. Also questioned was the definition used by Finland for landfill, which seemed to result in a surprising number of landfills. It was suggested that what in Finland is counted as a landfill, is considered a dump in other countries.

69. The fourth and final presentation, given by Ms. Sheshinski, concerned indirect methods used for waste statistics and waste indicators. She raised some basic questions about the good and bad points of direct and indirect measures. Mr. Vahvelainen was the discussant for this paper. The general conclusion was that waste statistics are complicated and that we should work together to better these statistics and the level of disaggregation.

70. Mr. Svein Homstvedt gave a brief summary of the issues raised. These included the problem that waste is connected to quantities, the problem of data reliability, and the problem associated with reporting systems – as these systems improve, historical data may be affected and time series will have to be revised. Mr. Homstvedt also questioned the need for an additional approach such as the calculation of expected lifetime intervals and material compositions. He concluded by listing the need for additional data such as economic cost, organization and response, logistic and transport, and direct and indirect emissions.

Session VI. Indicators of environment and health

71. Documentation:

WP 1: "Information for decision-making in health and environment", Lene Mikkelsen, UNECE
WP 19: "Environmental health indicators: development of a methodology for the WHO European region", Dafina Dalbokova, WHO-ECEH
WP 18: "Proposed core environmental public health indicators for the US-Mexico border region", Pierre Gosselin, WHO
WP 24: "Developing environmental public health indicators in Canada", Paul Samson, Canada
WP 7: "Environmental health indicators in a Danish health interview survey", Lis Keiding, Denmark
WP 14: "Health issue through the scope of environment statistics and the conjunction with various statistical schemes of data production", Kaia Oras, Estonia
WP 20: "Environmental health indicators in policy evaluation," Kahlmeier S. and Braun-Fahrländer, C., Switzerland
WP 8: "Note on the situation of environment and health indicators in Azerbaijan Republic", Rena Nazimova, Azerbaijan

72. The session was chaired by Lene Mikkelsen (UNECE), assisted by discussants Mr. M. Ezzati and Ms. S. Bartlett. Working Papers 1,19, 18 and 24 were presented to the meeting and discussed by Mr. Ezzati. Only some of the main conclusions from WP 1, which dealt with information for decision-making, were presented by the author. She stressed in particular the impact of the Rio Summit which had significantly increased the awareness of the environmental impact on health as well as the need for ensuring that relevant data was made available for decision-making. As environmental monitoring

capacities has increased so has the abundance of indicators used for monitoring environmental health. Many indicators, however, are being developed with little attention to the monitoring systems that are to produce the data. To improve data for monitoring, strategies should be developed to achieve a better coordination between collecting department/agencies; have more data collected at regional and local levels; increase the use of administrative records (geo-referenced data) and improve communication between users and producers. Indicators play a key role in monitoring environmental health but should be developed as part of the overall planning and involve from the beginning users and data producers. Moreover, to ensure that the best data and sources are used statisticians should be part of the process.

73. The representative from WHO's European Centre for Environment and Health informed the meeting of a new project WHO has developed which aims at monitoring environmental health through a common core set of indicators, using an agreed methodology and comparable data. The approach uses the DPSEEA framework and 10 policy areas are identified for environmental health concerns in the European region. The resulting indicators give information on exposures, health effects, and action taken in a standard and comparable format for counties. Feasibility testing has been carried out for the main issues and data quality, availability and usefulness have been evaluated. The main problems found in the pilot countries were the lack of cooperation among institutions, parallel initiatives on indicators, and insufficient human resources. The WHO core set of indicators would ensure harmonised reporting of environmental health across Europe, but would not preclude that additional national indicators were added for responding to different policy processes in countries.

74. The representative from WHO/PAHO's collaborating centre on Environmental and Occupational Health Impact Assessment and Surveillance told the meeting about their project to develop a core set of indicators to monitor public environmental health in a region consisting of 4 American and 6 Mexican states. The area covered is characterised by rapid urbanisation and industrialisation, high migration and poverty levels, fragile eco-systems and deficient sanitary and public health infrastructure. The primary goal of the project is to promote sustainable development, while specific goals include the improvement of public health, protection of water resources, development of infrastructure for water and solid waste treatment, etc. Four general public health objectives are applied to 8 traditional domains of environmental health and 50 indicators selected according to scientific criteria and use-based criteria by participants at a workshop.

75. Finally, a representative from Environment Canada told the meeting about a national Canadian project to determine a set of core indicators that link environmental factors to health outcomes with the objective to improve understanding of the relationship as well as to enable better accountability and transparency of government involved agencies. The DPSEEA framework was used and four broad themes covering nine issues identified, for each of these a series of indicators have been identified. The

framework is developed in full recognition that environmental health indicators are embedded within the broader context of sustainable development. It also adopts the principle of core indicators versus optional local indicators. The author recognised that the existence of quality information is a prerequisite for constructing environmental health indicators.

76. In discussing the four papers, Mr. Ezzati pointed out that indicators are a proxy for monitoring. One can monitor for policy purposes, for following progress of policy intervention, for public information or for intervention design. The are several problems with environmental risk factors: we have limited exposure data (e.g. we can survey smoking habits, but not exposure to bad air); risk factors are not evenly distributed but tend to exhibit geographic or socioeconomic clustering; exposure reduction to be effective need to be combined with other policies. He further commented on the shortcoming of the DPSSEA model which does not account for interaction between risk factors (e.g. interaction between asbestos and smoking). The Murray-Lopez model (1999) was suggested as another framework for analysis which would allow risk factor interaction to be measured. Further referring to measurement problems, he gave two examples which will influence results: neighbourhood distribution of ambient air pollution often show bigger differences than between cities and water quality differ according to whether measured at source or after storage.

77. He concluded that indicators are important for widespread regular and cost effect monitoring of environmental health risks but we need to link to health risks and benefits and to intervention design in a multi-causal manner. Furthermore, health risks are dynamic issues depending on rapid demographic/environmental change, to measure these we need complex data sets, links between sectors and disciplines, and to include non-health considerations (cost effectiveness, social justice, etc).

78. The second discussant summarized the four remaining papers, she particularly dwelled on the need to address some methodological and technical difficulties in relation to health impact assessment. For instance, a good system of environmental health indicators needs to be built on lengthy and costly research, good epidemiological time series, targeted exposure assessments, be able to withstand consistency issues, be sensitive to changes but robust to minor changes, be scientifically valid and easily understood. She also discussed the use of health surveys to obtain information on exposure, annoyance, risk behaviour and perception. Survey data are useful to augment measured data and may be the only practical way to get information for a larger population, however, indicators derived from such surveys may not be scientifically consistent as they are based on perception.

79. Several participants noted the usefulness of surveys for collecting health-related information. It was mentioned that these might often be the only means of obtaining data on behaviours, perceived health risks, and the specifics of exposure. It was noted, however, that even though existing surveys

could provide an inexpensive means of filling health data gaps, there are often obstacles to the addition of new questions to existing surveys.

80. It was observed that, even though we may have good frameworks for describing the pressures of environment on health, we lack the sophistication to determine where in the framework these health pressures enter. The discussant noted that this point is important, and that many papers seem to focus on pollution control rather than environmental control. Highlighted was the issue that although some problems appear to be conquered in the developed world (general food safety, for example), they should still be monitored.

81. It was stressed that, often, the focus of environmental health is on the problems caused by environmental exposures, rather than a holistic analysis that includes the benefits we derive from the environment. The discussant added that this is fundamentally important and reflects a difference between the fields of biophysical health and population health as outlined in his presentation. He further noted that it is important to separate health-impacting activities from activities themselves. Employment, like the environment, can be a source of negative and positive health impacts -- it is important to be specific when discussing activities in general. This "focus on the negative" was observed to be a feature of indicators in general.

82. There was some debate as to whether or not to include activities like smoking or traffic accidents in discussions of environmental health. It was argued that there is a danger in extending the scope too broadly and including behaviours. It was countered that the indoor environment is an important determinant of health and that a significant portion of our time is spent in this environment.

83. The lack of distinction between non-urban and urban environments in health surveys was noted. It was suggested that samples should be broadened to enable this distinction. It was cautioned, however, that there are important, different, confounding influences that can make geographic distinctions difficult. It was suggested that children could be a more appropriate target for such surveys, given that they have not yet had the time to accumulate confounding influences to the degree found in adults.

84. The chair asked how the choice of framework might influence the choice of indicators. The discussant suggested that it is the choice of indicators that imbeds value into a framework. As an example, an air pollution indicator could be based on economic activity in general, or on only certain forms of activity. It is these choices that affect analysis more than the framework. It was added however, that certain frameworks, such as the Murray-Lopez, can clarify the analysis of interactions

between elements. Other participants noted that some indicators are so fundamental that they will rise to the top, regardless of the framework or model chosen.

85. The chair closed by noting that much work still needs to be done on the basic data, concepts, and frameworks related to environment-health interactions and that these matters needed to be discussed in depth at other meetings.

Final session. Panel discussion on role of statistician in SDI

86. The final session was chaired by David Berry (USA, Department of the Interior). A panel composed of the chairs of the previous sessions discussed their interpretation of the role of statisticians in the Sustainable Development Indicators process. The chairman opened the discussion by listing the main issues, the obstacles and the opportunities presented by the work on SDIs. Clearly the different cultures in the different countries influence the part played by statisticians, but there was common consensus on many points:

- statisticians are essentially technicians, and therefore pose no threat to ministries, but rather support them by offering clarity and practicality to the mix of ideas;
- getting involved at an early stage in indicator selection and design involves a certain investment in time and energy, and needs enthusiastic persons to bring it forward, but it can pay dividends by ruling out at an early stage unfeasible and costly options, by ensuring that existing data sources are exploited as far as possible, and by ensuring that any changes to data collection are implemented at an early stage, an important factor given the time lag between identification of data needs and availability of data;
- the process may result in previously inaccessible, often administrative, data being made available for indicator purposes. The statistician can advise on the solidity and suitability of such data;
- indicators are not static, and can change depending on the target audience. However the fundamental data on which they are based should change as little as possible, if reliable trends are required;
- good communication is the key: communication between ministries and statisticians, between indicator producers and users. Statistical offices need to improve their presentation and reporting skills, otherwise they may find that the indicators are being taken out of context or badly interpreted. Statisticians are in the best position to present analyses of the data, as they know best the limitations of the data and therefore which messages are really coming from the figures and graphs;

- an active participation in the indicator process allows statistical offices to raise their profile, and to use the new demand for indicators to build public, political and financial support for their work, which is crucial to push forward this work and the basic data collection systems which underpin it.