UNITED NATIONS

E

Economic and Social Council

STATISTICAL COMMISSION
Twenty-sixth session
4-13 February 1991
Item 9 (e) of the provisional agenda*

DEMOGRAPHIC, SOCIAL AND ENVIRONMENT STATISTICS:
ENVIRONMENT STATISTICS

Methods of environment statistics developed under the work
programme of the Conference of European Statisticians

Report of the Secretary-General

SUMMARY

A brief history of the work of the Conference by European Statisticians in the field of environment statistics is presented in paragraphs 4-10. The development of standard concepts, definitions and classifications is described in paragraphs 11-45, with a general introduction in this area presented in paragraphs 11-13. The ECE Standard Statistical Classification of Land Use is described in paragraphs 14-19, the ECE Standard Statistical Classification of Water Use in paragraphs 20-24 and the ECE Standard Statistical Classification of Ambient Air Quality in paragraphs 25-45. The methodological discussions within the framework of the Conference of European Statisticians are presented in paragraphs 46 and 47. Perspectives for the future work of the Conference and international co-operation are outlined in paragraphs 48-53. Points for discussion are presented in paragraph 54. Summaries of the categories used in the classifications described earlier are contained in the annexes.

* E/CN.3/1991/1 and Corr.1.

CONTENTS

INTRODUCTION

1.   The Statistical Commission, at its twenty-fifth session (6-15 February 1989),
stressed that close co-operation between the Economic Commission for Europe (ECE)
and the Statistical Office of the United Nations Secretariat should be maintained,
including the methodological development of environment statistics. The Commission
also considered that some outputs of the work on methods of environment statistics
of the Conference of European Statisticians (CES) might contribute to work at the
global level. 1/ The Commission requested that a report on methods of environment
statistics, developed under the work programme of CES, be submitted to the
Commission at its twenty-sixth session. 2/

2.   The Working Group on International Statistical Programmes and Co-ordination,
at its thirteenth session (11-13 September 1989), requested ECE to provide
descriptions of the various relevant classifications and other aspects of
methodology that had been adopted by CES. It also requested ECE to include
information on experiences to date on the use of those classifications and other
aspects of methodology, with a view to assisting the Commission in identifying one
or more classifications or other methodological outputs of CES that may be
particularly appropriate for international adaptation and use.

3.   The present report is largely based on material submitted by ECE, but draws
also on the discussion of international methodological work at the first meeting of
the Intergovernmental Working Group on the Advancement of Environment Statistics
(Oslo, 2-4 May 1990). Following the request of the Working Group on International
Statistical Programmes and Co-ordination that the report give special attention to
methodological work, including the development of concepts, definitions and
classifications, and that the report include as much information about the relevant
classifications as possible, the development of an international environmental data
service is not described in the present report in order to comply with space
limitations. However, international co-operation in the co-ordination and
development of environmental data bases is discussed in the report of the
Secretary-General on progress made in the development of environmental statistics
and future plans (E/CN.3/1991/23).

I. BRIEF HISTORY OF THE WORK OF THE CONFERENCE OF EUROPEAN STATISTICIANS IN THE FIELD OF ENVIRONMENT STATISTICS

4.   As early as 15 February 1971, CES sought the views of member countries on what
should be done by the Conference in the field of environment statistics. A series
of meetings and seminars were held to determine the best way of proceeding in this
new field. A Meeting on Environmental Statistics, which the Conference convened
together with the Senior Advisers to ECE Governments on Environmental Problems at
Geneva from 9 to 13 January 1978, proposed a work programme consisting of three
major sub-areas: (a) frameworks; (b) concepts, definitions and classifications in
particular areas; and (c) methodological discussions. The general direction of the
work done in each of the three sub-areas defined by the January 1978 meeting is
discussed in the following paragraphs.

5.   First, regarding frameworks, there were two projects that received particular attention during the early phase of work under this sub-area, the Stress-Response Environmental Statistical System (STRESS) (developed in Canada) and natural resources accounting (applied in France and Norway). STRESS was used by the secretariat in relation to environmental compendia of four countries. In addition, a detailed report on a Canadian pilot study dealing with the Laurentian Lower Great Lakes was also discussed. With regard to resource accounting, a comparative analysis of the Norwegian System of Resource Accounts and the French Natural Patrimony Accounts was undertaken by the secretariat. In related work, both the possible and the existing links were discussed between environment statistics and the other two main domains in national statistical systems, that is, economic statistics and social and demographic statistics.

6.   A meeting held in October 1982 recommended shifting work towards the establishment of a system or set of environmental indicators. At a further meeting on the subject, an agreement was reached on the approach to be followed in the development of a draft set of ECE environmental indicators. Work involved the definition of a novel concept of environment indicators, an inventory of indicators that had been proposed at the international level and their evaluation in terms of the underlying indicator concept. The result was a first draft of the Set of ECE Environmental Indicators.

7.   Secondly, regarding concepts, definitions and classifications, several informal and formal meetings were held, leading to the following classifications or structures:

   (a) ECE Standard Statistical Classification of Land Use: a final revision of the classification took place in 1989, before it was adopted by the Conference at its plenary session in 1989 (CES/637);

   (b) ECE Standard Statistical Classification of Water Use: a revision of the water use classification took place in 1989, and the final classification was adopted by the Conference in June 1989 (CES/636);

   (c) Draft ECE Standard Statistical Classification of Ecological Freshwater Quality: a draft classification of ambient freshwater quality was developed and will be tested in 1990 (CES/668);

   (d) ECE Standard Statistical Classification of Ambient Air Quality: the first draft was finalized in 1989 and was adopted by the Conference at its 1990 plenary session (CES/667);

   (e) Draft ECE Standard International Framework for the Development of Fauna, Flora and Habitat Statistics: the first draft is yet to be submitted to the Conference for approval (CES/548/Add.4/Rev.1);

   (f) Draft ECE Standard Statistical Classification of Wastes: the draft classification was revised in 1989, and its results will be tested during 1990 (CES/638);

(g)   Draft ECE Standard Structures of Statistics on Economic Aspects of
Environmental Protection: a draft classification of environmental protection
facilities was agreed upon in 1989 and will be tested in the course of 1990
(CES/669).

8.   Thirdly, regarding methodological discussions, work was driven by two
circumstances.   On the one hand, the collection and compilation of large parts of
environment statistics make use of methods that are essentially different from
traditional methods applied in statistical offices.   On the other hand, the human
resources assigned to environment statistics in national offices were very small
initially.   As a result, a host of new problems met with extremely scarce
resources, so that the professional exchange of methodological experiences was
gladly accepted and even sought at an international level.

9.   These exchanges were initially organized in two ways.   Whenever a meeting on
environment statistics was convened by the Conference, methodological questions
related to the subject-matter under discussion were tabled.   Secondly, the second
Warsaw Seminar (September 1980) was also devoted to such discussions.   These two
ways of organization soon proved to be insufficient in view of a quickly rising
demand for methodological exchanges.   Methodological discussion only at meetings on
specific subject-matters did not permit an exchange of views on subject-matters on
which no meetings were held at a convenient time nor on general methodological
concerns.   Seminars, being a relatively expensive undertaking, could not cope with
the considerable amount of both requests for methodological discussions and offers
to contribute substantive discussion papers.

10.   Consequently, a meeting on organizational aspects of the related international
co-operation became necessary and was held in November 1981.   It recommended the
holding of annual meetings convened in one language.   The meeting also structured
the sub-area from a substantive point of view.   After approval of the related
recommendations by the Conference in June 1982, the first informal meeting of the
series was held at Helsinki in May 1983.   Also, the following meetings have been
invited to ECE member countries: by France (1984); by the Federal Republic of
Germany (1985); by Norway (1986); by Poland (1987); by the Netherlands (1988); by
Hungary (1989); and by Sweden (1990).   The next meetings are scheduled in Ottawa
(1991); Lisbon (1992); and Prague (1993).

II.   DEVELOPMENT OF ECE STANDARD CONCEPTS, DEFINITIONS
AND CLASSIFICATIONS

11.   Among the ECE classifications listed above, three have been adopted by CES,
namely, land use, water use and ambient air quality.   A description of these
classifications is provided in paragraphs 14 to 45 below.   In addition, summaries
of the categories used in these classifications are reproduced in the annexes to
the present report.   For the detailed definitions of terms and, in the case of
ambient air quality, an evaluation of analytical methods used in measuring
concentrations of air pollutants, the complete CES document for each classification
would have to be consulted.

12. No synthesis of national experiences with these ECE classifications has yet been prepared. Accordingly, ECE member countries participating in the twenty-sixth session of the Statistical Commission are invited to point out any such experiences that would assist the Commission in assessing the work of ECE for the identification of those classifications and methodologies that may be adapted and used at the international level (see sect. V, Points for discussion, below).

13. The ECE classifications were among the subjects referred to at the Intergovernmental Working Group on the Advancement of Environment Statistics convened by the Statistical Office of the United Nations Secretariat in May 1990 (for more information about this Working Group, see ESA/STAT/AC.37). As part of its discussion on the methodological development of environment statistics, the Working Group concluded that the existing ECE classifications were a good starting-point. However, it considered that particular limitations, such as inadequate linkages to economic statistics in the classifications, should be noted. The Working Group felt that beyond the definition of classifications, methodological development should also include details on the means of measurement and statistical techniques. With regard to applying the methodologies created in developed countries to the situation in developing countries, it was concluded that only by combining efforts between these countries could the difficulties be highlighted, and adaptations to national priorities and conditions made. The Working Group also decided that its initial work would focus on environment-related agricultural statistics, statistics of water use and water quality, and statistics of air pollution and energy use.

A. ECE Standard Statistical Classification of Land Use

(CES/637; see annex I for categories of the classification)

14. Land information is needed at three different levels. At the local level, it is required for the purposes of physical planning and land management. At the national level, the emphasis lies on needs for overall resource policy and management, including the planning of the future use of land, and on information requirements of environmental protection activities. At the international level, land information is used for comparative descriptions and analyses of national land use patterns.

15. The classification provides for a structure into which available national information can be cast in order to arrive at internationally comparable data. In addition, account is taken of the special national characteristics and purposes within which nationally available information is generated, as well as of possible other roles a land use classification is likely to play.

16. Four broad substantive concerns require land information, each creating specific needs. The first is the concern with the description of existing land use patterns. It calls for land information in terms of land cover. The second area comprises questions linked to demand for land from human activities in a broad sense. Such concerns stipulate the existence of information on the use of land, and its changes over time, in terms of a breakdown by type of human activity. The

third area of concern relates to environmental repercussions of land use. While information on land cover can be used as a starting-point in this context, the assessment of environmental impact, for example, necessitates the incorporation of ecological aspects into the classification. The fourth area focuses on the planning of the future development of land use patterns. This implies the need for information on potential or alternative uses of land, which can partly be met through capability assessments.

17. The four areas of concern are not mutually exclusive; their information needs overlap to some extent. Aspects of land cover, while being the easiest to collect statistical information on, are often interwoven to a considerable degree with activity aspects. The ECE Standard Statistical Classification of Land Use is a mixed classification of land cover and activity categories. The classification is dominated by physical characteristics at the one-digit level. In selecting this approach, emphasis was put on practical aspects of actual production of land use statistics.

18. The classification focuses on inventory data of land use. Statistical information on land use changes may be of equal or even greater interest to users of land information. The conceptual development of internationally comparable statistics on land use changes is undertaken by the Conference of European Statisticians in the framework of the development of a set of ECE Environmental Indicators. Statistics of land use changes could be derived from adequate inventory data, but could also be available from other sources.

19. This classification does not provide for information that would be directly relevant for the consideration of the degree of reversibility of land use changes. Likewise, it does not provide support to investigations into the intensity of "sealing" of land, which is of particular interest in relation to environmental aspects of human settlements. The exploration of possibilities to develop statistics in these two regards is among the issues left to future work on land information.

B. ECE Standard Statistical Classification of Water Use

(CES/636; see annex II for categories of the classification)

20. Water management aims at an optimal water economy within the recognized ecological functions of water. Among the bases for water management are quantitative data about aspects of the water cycle. Such aspects relate to both water quantities and water quality. The present classification covers water use only and provides a framework for the systematic compilation and presentation of data on offstream water uses. It is part of the ECE standard statistical classifications that were being developed by the Conference of European Statisticians for the purposes of environment statistics. Thus, the classification only covers a fraction of the statistical information needs of water authorities. Another part dealing with the assessment of water quality is the subject of the ECE Standard Statistical Classification of Ecological Freshwater Quality.

21. The water use classification serves three main purposes. First, it is intended to provide assistance to national statistical offices that embark on the development of a national system of water use statistics. Secondly, it provides concepts and definitions for use in international statistical surveys of water use. Thirdly, it contributes to the standardization of terms used in water use statistics at the international level.

22. It is recognized that these purposes cover but a small fraction of the data requirements for water resource studies or water demand management. A comprehensive data system that would satisfy such information needs would have to be complemented with economic parameters including information on end-uses and on costs. Any full-fledged development of such a comprehensive system should therefore ensure that the water use data could be linked as necessary to the economic variables of interest. The inclusion of appropriate linkages to the system of national accounts and balances in place can replace the need for including economic variables into the system of water use statistics.

23. In any national development of a water use statistical system, due attention should also be paid to the seasonal time pattern of water use. Adequate provisions should be made for access to timely data by all national, regional and local water management authorities. It should be noted that the classification is descriptive in nature, as opposed to normative. In particular, no harmonization of environmental protection standards is attempted.

24. International surveys of water use should relate to annual data for countries as a whole or for the most important regional river basins. It is recommended to use the following criteria in selecting such river basins: (a) the area of the river basin is at least 30,000 km^2; or (b) at least three countries share in the area. Detailed arrangements in this regard should be made by the participants in such surveys and should be spelled out in the related publications. Respondents to questionnaires used in international surveys should submit, together with the data they supply, information on the methods used in the measurement and compilation of such data, because an adequate interpretation of water use data can often only be made if sufficient methodological information is available. The data requirements implied by the classification may lead in individual countries to estimation. This is particularly true for the variables included in section 1 of the classification. In such cases, it is recommended that respondents make information available on the estimation method that was used.

C. ECE Standard Statistical Classification of Ambient Air Quality

(CES/667; see annex III for categories of the classification)

25. The quality of ambient air influences the state of environmental media, has effects on human health and the well-being of humans, animals and plant species, and affects built-up structures. Furthermore, measures to counterbalance the negative effects of a deteriorating quality of ambient air call for substantial economic efforts, so that the consequences of ambient air quality changes pertain to all major fields of social life.

26. Air quality is decisively influenced by the presence or absence of specific chemical elements or compounds as well as by the occurrence of certain physical phenomena. These characteristics originate from both natural sources and human activities. Polluting substances, after their emission to ambient air, diffuse and become diluted as a result of geographical and meteorological conditions. After certain chemical transformations, they can remain in the air for a short or a long time period and can eventually be deposited.

27. The purpose of comprehensive air quality statistics is to provide generalized statements about air pollution and the quality of ambient air. Such statements are needed in determining and quantifying factors that are decisive for both harmful effects of air pollution and possibilities for pollution abatement measures.

28. Air pollution can be seen in four phases: emission of pollutants, their concentration in ambient air, their deposition, and the exposure of humans, animals and plants, as well as buildings. However, exposure statistics are at present only rarely available. Instead, exposure is frequently assessed on the basis of concentration data. Thus, for the time being, exposure is not covered as such by this classification.

29. The inclusion of the remaining three phases specified above can also be justified in terms of environmental problems related to air pollution. The contribution of emissions, concentrations, and depositions to acidification, corrosion, eutrophication, climate changes, health risks, accumulation of persistent substances and photochemical oxydants, forest damage, the economic aspects of these consequences, as well as of any remedial action, to name the most prominent of environmental problems attributed to air pollution, can be studied with the help of relevant statistical information. The purposes of such studies determine which pollutants to include and which statistical variables to use.

30. Air pollution can be caused by natural as well as anthropogenic sources. Generally, however, the emission of pollutants, that is, primarily chemical elements and compounds, from socio-economic processes receives the most interest. The statistical description of such emissions covers their sources and the quantities emitted. The selected data are used for regulatory purposes as well as for the development of pollution abatement strategies. In addition, emission statistics can be and are widely used in the estimation and modelling of air pollution, for example in environmental, economic and dispersion models. Deposition statistics, together with available information on critical loads of areas or ecosystems concerned, are increasingly requested for research and management purposes.

31. Concentration data are primarily used for the monitoring of environmental problems of air quality at various scales. At the global level, large-scale changes in atmospheric constituents influencing weather and climate are of special interest. The overall impact of human activities on air quality can be studied in broad terms at the regional level. For the local level, ambient air quality standards are usually cast in terms of concentrations.

32. Environment statistics in general, and air quality statistics in particular, are to a considerable extent intended for the general public. It also appears that environment statistics are being increasingly used by decision makers other than environmental managers. Their data requirements seem to resemble more those of the general public than those of environmental managers. The data needs of the general public differ from those of environmental managers in that statistical generalizations play a larger role than time and site-specific monitoring data. This circumstance influences both the concepts chosen for this classification and the ways in which air quality statistics should be presented. At the conceptual level, variables that are representative of widely encountered environmental problems should be selected for the purposes of an international standard classification. In presentation, the focus should be on techniques that facilitate the recognition of the patterns dominating the development of air quality over time and that avoid at the same time easy misinterpretation of the statistical data.

33. This classification provides for conceptual and classificatory guidance regarding the development of ambient air quality statistics. It intends to support national as well as international efforts. It is in principle limited to those pollutants for which international standard recommendations regarding the measurement and analysis of ambient air samples are currently available. In a few instances, pollutants are also included that are widely measured, but for which corresponding international standard recommendations have not yet been developed. The classification attempts to reflect current data capabilities in order to promote its wide use in international collection, compilation and presentation of air quality statistics.

34. The part of the classification dealing with chemicals should be looked upon as a reference framework for the long-term development of air quality statistics. The framework is primarily derived from the availability of internationally standardized measurement techniques and analytical methods or at least that of widely applied routines. It indicates the purpose for which data should be collected: for emission statistics, for local, for national/regional background and/or for global air pollution statistics. Not all of the compounds listed are proposed for the preparation of statistics in the short run. Those proposed for present data collection are repeated in subsequent sections of the classification.

35. The section on emissions exclusively relates to anthropogenic emissions of air polluting substances. Emissions from stationary combustion sources, from industrial non-combustion sources (including evaporation), from non-industrial and domestic sources (including residential heating) and from mobile sources are distinguished. Emissions from the combustion of fuels and from other processes can differ in their composition, volume and seasonal pattern. At a second level, it is also proposed to provide data for a selected number of economic activities and for type of fuel.

36. Air pollution emissions can be measured directly, or can be estimated on the basis of fuel and other material consumption data and process-specific emission factors. While some countries prefer measurement to estimation, data are more frequently available from estimations. Estimation procedures are at hand for a number of pollutants, as is relatively sound information on the reliability of

estimates. The classification does not aim at standardizing estimation procedures. Emission data (either measured or estimated) should be reported and presented together with information on the measurement and/or estimation method used.

37. For international data reporting, the use of annual national totals is recommended. For national purposes, regional and even site-specific emission data may have to be used together with information on seasonal variations.

38. Concentration of pollutants in ambient air can be measured at different distances from their sources of emission. As a rule, a maximum of concentrations, which is caused by the source (or sources), is found in their proximity. The influence of the source on concentration levels decreases generally with growing distance from the source, except for pollutants depending on the existence of synergistic effects. Accordingly, a distinction is made in the classification between "impact" and "background" concentrations. In addition, "regional background" concentrations are separated from "global background" concentrations. The different types of concentrations are measured at like-named stations.

39. Statistics based on measurements carried out at impact stations describe local air quality. These measurements are influenced by the type of air polluting activities carried out in the neighbourhood of the measurement station, together with meteorological and physical factors. Attempts are sometimes made to classify different impact stations by the type of area in which they are located. For example, the Global Environmental Monitoring System (GEMS) uses a sixfold classification of urban areas for the purpose of urban air pollution statistics. If the GEMS classification is used for urban air quality statistics, data presentation should include information on the location of the measurement station. When impact stations exist outside the direct influence of local sources, it should be studied whether these stations could be used as background stations for those stations measuring the direct impact of local air pollution sources.

40. The aim of deposition statistics is to cover total deposition, that is, both wet and dry deposition. Deposition statistics, as recommended in this classification, however, cover wet depositions of acids and acidifying compounds. Statistics on wet acidifying deposition are based on the chemical analysis of precipitation at background stations. The volume of wet acidifying deposition is calculated as the product of the concentration of the given component in precipitation and the volume of precipitation. For the purposes of international data reporting, annual national totals should be reported.

41. The input of dry deposition into soil, vegetation, surface waters and materials is also of environmental significance. However, dry deposition is not included in the classification because of the current absence of systematic measurement data and of uncertainties in determining deposition velocities. For some compounds, the relationship between pollutant concentration in air and in the aqueous phase is relatively well-known. For most compounds, however, this relationship is at present unknown.

42. Information on depositions can also be obtained indirectly, that is, by measuring the accumulation of deposited substances in plants. No recommendations

for such measurements are for the time being included in this classification.
However, as indirect measurements of deposition are becoming more common, the
classification is sufficiently flexible in order to allow for the inclusion of
related recommendations as soon as is regarded appropriate.

43. Many air quality statistics are usually based on monitoring. This implies
that statistical generalization of data is impeded by the site-specificity of
monitoring data, the characteristics of measurement sites, sample design and
specification, calibration, and the sampling and analytical methods used. The
repercussions of these aspects on data reliability and comparability are only known
to some extent. Future work should bring about clarifications in this respect. Of
special interest appear to be studies into the relationship between site
characteristics and levels of measured data. The detailed specification of
information needed on site characteristics should be deferred until after knowledge
of the relationship has improved. Furthermore, future methodological studies
should shed further light on possibilities for valid generalizations of monitoring
data into air quality statistics.

44. An annex of the classification provides a review of analytical methods
commonly used in air quality measurements. The aim of the review is not to
standardize measurement and analytical practices but to serve as a reference
framework for the air quality classification and for the purpose of international
data collection. Existing variations in measurement and analytical methods between
station practices should give rise to the use of adequate techniques of data
presentation. Such techniques include references to measurement techniques and
analytical methods used, to site characteristics of the relevant stations, to
meteorological conditions etc. The use of more than one statistical measure to
describe statistical distributions of variables as well as the use of maps,
isopleths and other graphic techniques are also ways of reducing the impression of
"spurious accuracy" of air quality statistics. Furthermore, the conditions that
have to be met in terms of, for example, e.g. data completeness before reliable
trends can be calculated should be explored. Also, methods used in the correction
or adjustment of time series for different types of background conditions should be
compared and evaluated.

45. Further development of air pollution statistics should include the development
of physical measures of pollution abatement facilities. The related work could
perhaps best be undertaken in connection with the ongoing conceptual work by the
Conference of European Statisticians on economic aspects of environmental
protection. Finally, a systematic conceptual and methodological exploration of the
scope and limits of exposure statistics is required. Such statistics could be
obtained from direct measurement, but could also be derived from the application of
appropriate estimation procedures to concentration and emission data.

III. METHODOLOGICAL DISCUSSIONS WITHIN THE FRAMEWORK
OF THE CONFERENCE OF EUROPEAN STATISTICIANS

46. The discussion of methodological problems between national experts in a sort
of "purpose-free" ambiance has turned out to be instrumental to progress also in

regard to conceptual work. Thus, methodological discussions were in the past always held at subject-matter meetings. On occasion, seminars were organized, which dealt with more comprehensive issues. A seminar held at Warsaw in 1974, however, was devoted more to a consideration of how to organize the development of international environment statistics.

47. A second Warsaw seminar, in 1980, dealt with a wide range of methodological issues. A further seminar organized by the Conference on the question of ecological statistics, was held in Rome in April 1988. Since that time, the strategy is to devote seminars to the interdisciplinary discussion of issues that also have a strong component of environment statistics. Since 1983, the most frequently used vehicle for methodological work is the annual work sessions dealing with these problems. The most recent Work Session on Specific Methodological Issues in Environment Statistics was held at Stockholm from 5 to 8 June 1990 and dealt with statistics on marine environment, water use and quality and related statistics, and fauna and flora and related statistics.

IV. PERSPECTIVES FOR FUTURE WORK OF THE CONFERENCE

48. The perspectives for future work have to be derived from several circumstances. There is first of all the changing context of international co-operation in Europe in general, and of statistical multilateral international co-operation in particular. The Conference has started to determine its future role in relation to the universal changes, and environment statistics were retained in the short list of three work areas being given top priority.

49. The second relevant aspect is the ongoing concern about concentrating on work methods that are particularly cost-efficient, for both the United Nations Secretariat and Member countries. This trend seems to favour work that is not excessively dependent on the holding of international meetings, that is, more data work.

50. Finally, the past record of the work is to be taken into account in such a way that the particularly successful types of projects will be strengthened. This aspect probably implies that the conceptual work on statistical nomenclatures will be extended to further areas.

51. Taking these circumstances together, it can be expected that the development of an international data service will become more important in future work. Secondly, standard concepts and, where necessary, classifications will be finalized where drafts exist and will be developed in new areas. The new areas already included in the work programme, but not yet tackled, are marine water quality, chemicals from an environmental point of view, noise and radioactivity. It can be expected that a more systematic coverage of the interface between the economy and the environment will also be attempted in the not too distant future. Finally, the entire area of socio-environmental interrelations is as yet untouched. In this field, perhaps, statistics on environmental health will become a starting-point for conceptual work.

52. The methodological discussions will in all likelihood be maintained as currently organized, as they seem to have reached an optimal scheme. Thus, on the whole, there are few possibilities for savings in the programme, but increasing demands in important fields. The ECE secretariat has recently anticipated these developments by mobilizing additional resources within the rather tight limits of current conditions.

53. There is a need to assess the experience gained in national and international applications of ECE classifications and methodologies. Such assessment would facilitate deciding which classifications could be recommended directly for world-wide use and which others need further modification and development. The Intergovernmental Working Group on the Advancement of Environment Statistics could play an important role in assisting the Statistical Office of the United Nations Secretariat in such methodological development. Priorities would have to be set for such work in the short-term and long-term work programmes of the Statistical Commission and the CES.

V. POINTS FOR DISCUSSION

54. The Statistical Commission may wish:

(a) To indicate its experience with the application of the ECE classifications in the areas of land use, water use and ambient air quality, as adopted by CES;

(b) To discuss the relevance of these classifications for countries at different stages of development, with a view to determining if any of these classifications might qualify for immediate world-wide recommendation and application;

(c) To provide guidance on the priorities of future work on those classifications and methodologies that require further modification for international use, including those that have not yet been adopted by CES (see para. 7 above);

(d) To provide guidance on the modalities (including support from extrabudgetary sources) for the incorporation of ECE classifications and methodologies in the proposed work programme of the Statistical Office (see report of the Secretary-General on progress made in the development of environmental statistics and future plans (E/CN.3/1991/23)).

Notes

1/ Official Records of the Economic and Social Council, 1989, Supplement No. 3 (E/1989/21), para. 148.

2/ Ibid., para. 153 (h).

Annex I

CATEGORIES OF THE ECE STANDARD STATISTICAL
CLASSIFICATION OF LAND USE

1. Agricultural land

    1.1 Arable land

    1.2 Land under permanent crops

    1.3 Land under permanent meadows and pastures

    1.4 Other agricultural land, n.e.s.

    1.5 Total agricultural land
         of which: Fallow agricultural land

2. Forest and other wooded land

    2.1 Total land under forest and other wooded land
         of which: Stands of exotic species
                    Particularly fire-prone stands

         2.1.1 With wood production the recognized major function

         2.1.2 With protection, conservation and biological use the recognized
                major functions

         2.1.3 With recreation the recognized major function

    2.2 Land under coniferous forest

         2.2.1 (same as 2.1.1)

         2.2.2 (same as 2.1.2)

         2.2.3 (same as 2.1.3)

    2.3 Land under non-coniferous forest

         2.3.1 (same as 2.1.1)

         2.3.2 (same as 2.1.2)

         2.3.3 (same as 2.1.3)

2.4 Land under mixed forest

    2.4.1 (same as 2.1.1)

    2.4.2 (same as 2.1.2)

    2.4.3 (same as 2.1.3)

2.5 Other wooded land

    2.5.1 (same as 2.1.1)

    2.5.2 (same as 2.1.2)

    2.5.3 (same as 2.1.3)

3. Built-up and related land (excluding scattered farm buildings)

3.1 Residential Land

    3.1.1 With mainly one- or two-storey buildings

    3.1.2 With mainly three- and more storey buildings

3.2 Industrial land (excluding land classified under 3.3 below)

3.3 Land used for quarries, pits, mines and related facilities

    3.3.1 For peat cutting

    3.3.2 For other open-cast mining and quarrying

    3.3.3 Other, n.e.s.

3.4 Commercial land

3.5 Land used for public services (excluding transport, communication and technical infrastructure)

3.6 Land of mixed use

3.7 Land used for transport and communication

    3.7.1 Land under roads

    3.7.2 Land under railways

    3.7.3 Land under airports and related facilities

    3.7.4 Other land used for transport and communication, n.e.s.

3.8 Land used for technical infrastructure

    3.8.1 Land used for the disposal of wastes

    3.8.2 Land used for water supply and waste-water treatment

    3.8.3 Land used for electricity generation and distribution

    3.8.4 Other land used for technical infrastructure, n.e.s.

3.9 Recreational and other open land

    3.9.1 Parks, green areas, hobby gardens, cemeteries, etc.

    3.9.2 Recreational land mainly occupied by camping sites, secondary residences or vacation houses

    3.9.3 Land under current construction

    3.9.4 Land intended for future construction

    3.9.5 Other, n.e.s.

4. Wet open land

4.1 Mires

    4.1.1 Ombrogenous mires (upland moors)

    4.1.2 Soligenous mires (lowland bogs)

4.2 Wet tundra

4.3 Other wet open land, n.e.s.

5. Dry open land with special vegetation cover

5.1 Heathland

5.2 Dry tundra

5.3 Mountainous grassland

    5.3.1 Used for grazing of domestic animals

    5.3.2 Not used for grazing of domestic animals

5.4 Other, n.e.s.

6.   Open land without, or with insignificant, vegetation cover

    6.1   Bare rocks, glaciers, perpetual snow

        6.1.1   Bare rocks

        6.1.2   Glaciers and perpetual snow

    6.2   Sand-beaches, dunes, other sandy land

    6.3   Other, n.e.s.

7.   Waters

    7.1   Inland waters
       of which: In harbour areas

        7.1.1   Natural watercourses

        7.1.2   Artificial watercourses

        7.1.3   Inland sea (freshwater or saline), lakes, ponds, coastal
                land-locked bodies of water

        7.1.4   Artificial water impoundments

        7.1.5   Other inland waters, n.e.s.

    7.2   Tidal waters
       of which: In harbour areas

        7.2.1   Coastal lagoons

        7.2.2   Estuaries

        7.2.3   Other tidal waters, n.e.s.

Annex II

CATEGORIES OF THE ECE STANDARD STATISTICAL
CLASSIFICATION OF WATER USE

1. Water resources [Unit: 10^6 or 10^9 m^3/year; per cent where stated]

    1.1 Inflow of surface water

        1.1.1 Long-term annual average

        1.1.2 Current year

    1.2 Outflow of surface water

        1.2.1 Long-term annual average

        1.2.2 Current year

    1.3 Precipitation

        1.3.1 Long-term annual average

        1.3.2 Current year

    1.4 Evaporation

        1.4.1 Long-term annual average

        1.4.2 Current year

    1.5 Annual change in groundwater resources [volume or per cent]

    1.6 Groundwater available for annual abstraction

2. Water abstraction [10^3, 10^6 or 10^9 m^3/year]

    2.1 Abstraction from surface water resources

    2.2 Abstraction from groundwater resources

    2.3 Abstraction from other water resources

    2.4 Total abstraction by type of activity (2.1 + 2.2 + 2.3)

    2.5 Returned water by type of activity

    2.6 Net total abstraction by type of activity (2.4 - 2.5)
         of which: Treated prior to first use

The following classification by type of activity (ISIC/Rev.3) is recommended:

(1) Domestic sector

(2) Collection, purification and distribution of water (ISIC 41)

(3) Agriculture, forestry, hunting, fishing and related service activities
     (ISIC 01 to 05)

(4) Mining and quarrying (ISIC 10-14)

(5) Manufacturing (ISIC 15-37)

(6) Production, collection and distribution of electricity (ISIC 401)

(7) Construction (ISIC 45)

(8) Other activities

3.   Water supply [10^3, 10^6 or 10^9 m^3/year]

3.1 Public supply by type of activity

3.2 Self-supply by type of activity

3.3 Other supply by type of activity

3.4 Total supply by type of activity

3.5 Losses during transport

The following breakdown by type of activity (ISIC/Rev.3) is recommended:

(1) Domestic sector

(2) Agriculture, forestry, hunting, fishing and related service activities
     (ISIC 01 to 05)

(3) Mining of coal and lignite; extraction of peat (ISIC 10)

(4) Other mining and quarrying (ISIC 11 to 14)

Subtotal: Total mining etc. (ISIC 10-14)

(5) Manufacture of basic metals (ISIC 27)

(6) Manufacture of transport equipment (ISIC 35)

(7) Manufacture of textiles, wearing apparel; dressing and dyeing of fur;
     tanning and dressing of leather; manufacture of luggage, handbags,
     saddlery, harness and footwear (ISIC 17-19)

(8) Manufacture of paper and paper products (ISIC 21)

(9) Manufacture of chemicals and chemical products (ISIC 24)

(10) Manufacture of coke, refined petroleum products and nuclear fuel (ISIC 23)

(11) Other manufacturing

Subtotal: Total manufacturing (ISIC 15-37)

(12) Production, collection and distribution of electricity (ISIC 401)

(13) Other industrial activities

Subtotal: All industrial activities

(14) Other activities

4. Agricultural and industrial use of water [10^3 or 10^6 m^3/year]

   4.1 Agricultural and similar use of water

      4.1.1 Spray irrigation

      4.1.2 Flood irrigation

      4.1.3 Offstream fish farming

      4.1.4 Other agricultural or similar use

   4.2 Industrial use of water

      4.2.1 Cooling in electricity generation

      4.2.2 Cooling, except in electricity generation

      4.2.3 Consumptive use of water

      4.2.4 Other industrial use

      4.2.5 Recycled water

Categories 4.2.1 to 4.2.5 should be broken down by type of industrial activity. It is recommended to use activities (3) to (13), as appropriate, of the list of activities specified under section 3 above for this purpose, including the related subtotals.

5. Waste-water [10^3, 10^6 or 10^9 m^3/year]

   5.1 Collection of waste-water through public sewerage
        of which: From industry

5.2 Generation of waste-water in industry by type of activity

5.3 Waste-water treatment

    5.3.1 In public treatment plants

        5.3.1.1 Mechanical treatment technology

        5.3.1.2 Biological treatment technology

        5.3.1.3 Advanced treatment technology

    5.3.2 In industrial treatment plants

        5.3.2.1 Mechanical treatment technology

        5.3.2.2 Biological treatment technology

        5.3.2.3 Advanced treatment technology

    5.3.3 Total waste-water treated
        of which: Treated to national standards

5.4 Discharge of waste-water

    5.4.1 From public sewerage without treatment

    5.4.2 From public sewerage after treatment

    5.4.3 From industry without treatment (by type of activity)

    5.4.4 From industry after treatment (by type of activity)

    5.4.5 Total discharge of waste-water

        5.4.5.1 Into inland waters

        5.4.5.2 Into coastal sea

For information: Losses of waste-water during transport

                   Total discharge of cooling water

5.5 Sludge from waste-water treatment

    5.5.1 Generation

        5.5.1.1 In public treatment plants

        5.5.1.2 In industrial treatment plants

5.5.2 Use or treatment/disposal of sludge from public treatment
plants

     5.5.2.1 Use in agriculture

     5.5.2.2 Other use

     5.5.2.3 Incineration

     5.5.2.4 Dumping at sea

     5.5.2.5 Dumping on land

5.5.3 Use or treatment/disposal of sludge from industrial treatment
plants

     5.5.3.1 Use in agriculture

     5.5.3.2 Other use

     5.5.3.3 Incineration

     5.5.3.4 Dumping at sea

     5.5.3.5 Dumping on land

The activity breakdown recommended for use in relation to section 5 is that
specified in section 4.

Annex III

CATEGORIES OF THE ECE STANDARD STATISTICAL
CLASSIFICATION OF AMBIENT AIR QUALITY

A. Chemicals and their relevance in measurement/estimation

(E = emissions; C = concentrations; I = at impact stations; B = at national or regional background stations; G = at global background stations)

	E	CI	CB	CG
1. Sulphur compounds				
1.1 Sulphur oxides (including emissions of hydrogen sulphide)	X	X	X	
1.2 Particulate sulphate			X	X
2. Oxidized nitrogen compounds and oxidants				
2.1 NOX (excluding nitrous oxide)	X	X	X	
2.2 Nitric acid and particulate nitrate		X	X	X
2.3 Ozone: tropospheric			X	X
stratospheric				X
2.4 Nitrous oxide (tropospheric)				X
3. Reduced nitrogen compounds				
3.1 Ammonia	X	X	X	
3.2 Particulate ammonium compounds		X	X	X
4. Inorganic carbon compounds				
4.1 Carbon monoxide	X	X		X
4.2 Carbon dioxide	X			X
5. Halogens and inorganic halogen compounds	X		X	
6. Volatile organic compounds a/ (including halogenated compounds)				

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a/ It may become possible to add relevant dioxins (toxic polychlorinated debenzo dioxins and furans) as a separate group under this heading once sufficiently reliable emission and/or concentration data become available.

	E	CI	CB	CG
6.1 Methane		X		X
6.2 Non-methane compounds	X	X	X	
6.2.1 Aldehydes	X	X	X	
6.2.2 Chlorofluorocarbons (CFCs)	X			X
6.2.3 Halons	X			X
6.2.4 Other halogenated hydrocarbons	X			X
7. Heavy metals (to be specified)	X	X	X	
8. Suspended particulate matter	X	X	X	X
9. Chemical composition of precipitation water			X	X

B. Emissions
[tonnes/year]

1. Emissions from stationary sources

   1.1 By process

       1.1.1 Combustion of fuels

             1.1.1.1 In power plants

             1.1.1.2 In industrial establishments, excluding power plants

             1.1.1.3 In other economic activities and domestic heating

       1.1.2 Other processes, including evaporation

             1.1.2.1 In industrial sources

             1.1.2.2 In non-industrial and domestic sources

   1.2 By activity

       1.2.1 Agricultural etc. (ISIC 01)

       1.2.2 Mining and quarrying (ISIC 10-14)

       1.2.3 Manufacture of paper and paper products (ISIC 21)

1.2.4 Manufacture of coke (ISIC 231)

1.2.5 Manufacture of refined petroleum products (ISIC 232)

1.2.6 Manufacture of chemicals and chemical products (ISIC 24)

1.2.7 Manufacture of rubber and plastic products (ISIC 25)

1.2.8 Manufacture of other non-metallic mineral products (ISIC 26)

1.2.9 Manufacture of basic iron and steel (ISIC 271)

1.2.10 Manufacture of basic precious and non-ferrous metal (ISIC 272)

1.2.11 Electricity, gas, steam and hot water supply (ISIC 40)

1.2.12 Other economic activities

1.2.13 Households

1.3 By availability of cleaning

1.3.1 Without cleaning

1.3.2 With cleaning or equivalent device

2. Emission from mobile sources

2.1 From road transport

2.1.1 Using motor spirit (gasoline)

2.1.2 Using gas (diesel) oil

2.1.3 Using other fuels

2.2 From railway transport

2.3 From other transport

2.4 From other mobile sources

Emissions should at this time be reported on the following materials:

Sulphur oxides, including hydrogen sulphide [in units of SO_2]

NOX, excluding nitrous oxide [in units of NO_2]

Ammonia

Carbon monoxide

Carbon dioxide [in units of CO2]

Total volatile organic compounds, including halogenated compounds

Lead

Mercury

Cadmium

Suspended particulate matter

Emission data on items 1.1.1.1 to 1.1.1.3 should be broken down by type of fuel as follows:

Coal and coal products

Products obtained from petroleum refineries

Natural gas

Other fuels

C.   Concentrations in ambient air

2.1   Concentrations at impact stations

    2.1.1   Sulphur oxides [expressed as SO2]

    2.1.2   Nitrogen oxides [expressed as NO2]

    2.1.3   Carbon monoxide

    2.1.4   Volatile organic compounds (VOCs) (to be specified)

    2.1.5   Lead

    2.1.6   Mercury

    2.1.7   Cadmium

    2.1.8   Suspended particulate matter

2.2   Concentrations at national/regional background stations

    2.2.1   Sulphur oxides [expressed as SO2]

    2.2.2   Particulate sulphate

2.2.3 Nitrogen oxides [expressed as NO2]

2.2.4 Nitric acid and particulate nitrate

2.2.5 Ozone (tropospheric)

2.2.6 Ammonia

2.2.7 Particulate ammonium compounds

2.2.8 VOCs (to be specified)

2.2.9 Chemical composition of precipitation (pH/H+ ammonium, nitrate, chloride and sulphate ions, sodium, potassium, magnesium and calcium ions, conductivity)

2.3 Concentrations at global background stations

2.3.1 Ozone (stratospheric)

2.3.2 Carbon dioxide

2.3.3 Methane

2.3.4 CFCs

2.3.5 Halons

2.3.6 Nitrous oxide

2.3.7 Suspended particulate matter

D. Depositions

3.1 Wet acidifying deposition

3.1.1 Sulphur dioxide and sulphate expressed in sulphur content

3.1.2 Nitrogen dioxide, nitric acid and nitrate expressed in nitrogen content

3.1.3 Ammonia and ammonium compounds expressed in nitrogen content

3.1.4 pH/H+

Note: Other deposition indicators may be added, once their development is sufficiently advanced.