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WATER, LAND AND BIODIVERSITY INDICATORS¹

SUMMARY

This document presents descriptions of relevant indicators for the guidelines on the application of environmental indicators for Eastern Europe, Caucasus and Central Asia (EECCA). For technical reasons, the descriptions of other indicators are contained in separate documents, as follows: introduction and climate change (ECE/CEP/AC.10/2006/6), air pollution and the ozone layer (CEP/AC.10/2005/4, annex II), water (ECE/CEP/AC.10/2006/7), agriculture and waste (ECE/CEP/AC.10/2006/9), energy and transport (ECE/CEP/AC.10/2006/10). The Working Group is expected to agree on the guidelines and submit them to the Committee on Environmental Policy for adoption.

¹ Prepared by the secretariat on the basis of the outcome of the Workshop on the Application of Environmental Indicators held on 5–6 July 2004 in Chisinau, Republic of Moldova (CEP/AC.10/2005/4) and the decision taken by the Working Group on the matter at its fifth session (CEP/AC.10/2005/2, para. 23).

NON-TREATED URBAN WASTEWATER²

General description

1. **Brief definition:** The indicator defines the share of non-treated urban wastewater that was discharged into water bodies in the total generation of urban wastewater in the country in a calendar year.
2. **Unit of measurement:** Percent.

Relevance for environmental policy

3. **Purpose:** The indicator provides a measure of the response to the efficiency of the wastewater management system.
4. **Issue:** Wastewater from urban areas exerts significant pressure on the water environment because of loads of organic matter and nutrients as well as hazardous substances. The inability to ensure treatment of the total amount of wastewater delivered to urban aeration plants, due to their insufficient capacity or inefficient use, is one of the substantive factors of anthropogenic load onto aqueous ecosystems. The indicator defines the share of untreated urban waters discharged into water bodies with the goal of estimating the level and nature of the load on natural water, obtaining source information and developing nature conservation arrangements and monitoring their efficiency.
5. **International agreements and targets:** The Convention on the Protection and Use of Transboundary Watercourses and International Lakes and its Protocol on Water and Health. In the European Union, the Directive on urban waste water treatment (91/271/EEC) aims to protect the environment from the adverse effects of urban wastewater discharges. It prescribes the level of treatment required before discharge and requires Member States to provide all agglomerations of more than 2,000 inhabitants with collecting systems. It also requires all wastewater collected to be appropriately treated. It has to be fully implemented in the EU-15 countries by 2005 and in the 10 new Member States by 2008–2015.

Methodology and guidelines

6. **Data collection and calculations:** Monitoring of discharges from urban wastewater treatment plants should provide for obtaining representative information on the quantity of wastewater not treated at the urban wastewater treatment plants. When conducting primary metering, the users should provide for the required frequency of sampling at water outlet points. When using instrumental measurements of wastewater discharges, it is necessary to use hydrometrical equipment certified and calibrated by the state standardization bodies. Nature conservation bodies should exercise well-established control over the quality and authenticity of primary measurements. Processing of source data and its inclusion in informational database should be done using updated information technologies. Major difficulties in obtaining representative data on the quantity of wastewater not treated by urban wastewater treatment

² Other water indicators are contained in document ECE/CEP/AC.10/2006/7.

plants are confined to low frequency of primary sampling and lack of sophisticated hydrometrical equipment that would make it possible to measure wastewater quantity.

7. **Internationally agreed methodologies and standards:** None.

Data sources and reporting

8. EECCA countries have departmental and national databases concerning quantities of wastewater not treated at urban wastewater treatment plants. Information is entered into the state water cadastre. EECCA countries reported data to the United Nations Statistics Division (UNSD) in response to the Questionnaire on Environmental Statistics developed by UNSD and the United Nations Environment Programme (UNEP).

References at the international level

- Fomin, G.S. *Water: Control of Chemical, Bacterial and Radiation Safety According to International Standards*. (Moscow: Protector, 1995)
- *Standard Methods for the Examination of Water and Wastewater*. 19th ed. (American Public Human Health Association, 1992)
- *GEMS/WATER Operational Guide*. 3rd ed. (WHO, 1992)
- Directive 2000/60/EC of the European Parliament and the Council
- Directive 91/271/EEC of the European Parliament and the Council
- <http://www.unece.org/env/water/welcome.html>
- http://unece.org/env/europe/monitoring/landR_en.html
- <http://unece.org/env/europe/monitoring/EnvMonRep/index.html>
- <http://www.unhabitat.org>
- <http://www.europa.eu.int/comm/eurostat/>
- <http://unstats.un.org/unsd/environment/questionnaire2004.htm/>
- <http://themes.eea.eu.int/IMS/CSI/>
- <http://www.euro.who.int/ehindicators/>

LAND UPTAKE

General description

9. **Brief definition:** Land uptake by transport infrastructure and urban development and by landfills, waste dumps, tailing pits and refuse heaps in a country.

10. **Unit of measurement:** Square kilometres or hectares; percent of the total territory of the country, and the contributions of the various land-cover categories to land uptake as a percentage of the total territory.

Relevance for environmental policy

11. **Purpose:** The indicator provides a measure of the impact on the environment and shows trends in the encroachment of artificial land developments on natural and semi-natural land.

12. **Issue:** Land uptake by transport infrastructure and urban development and by landfills, waste dumps, tailing pits and refuse heaps has the highest impacts on the environment due to sealing of soil as well as disturbances resulting from transport, noise, resource use, waste dumping and pollution. Transport networks, which connect cities, add to the fragmentation and degradation of the natural landscape. The intensity and patterns of urban sprawl are the result of three main factors: economic development, demand for housing and extension of transport networks. A high percentage of land used for waste dumps, landfills, tailing pits and refuse heaps for legal or illegal waste disposal is an indicator of unsustainable development. Reduction of this indicator signals improvement toward sustainable development. In order to reduce and to prevent further increase in the amount of land used for waste dumps, landfills, tailing pits and refuse heaps, it is important to improve waste management and introduce cleaner production methods.

13. **International agreements and targets:** None.

Methodology and guidelines

14. **Data collection and calculations:** Units of measurement are hectares or square kilometres. Results are presented as average change, percent of the total area of the country and percent of the various types of land cover used by transport infrastructure, urban development and landfills, waste dumps, tailing pits and refuse heaps in a country. Land use by urban and related infrastructures is generally calculated using statistical data. In a few EECCA countries these data are supplemented by satellite images. Difficulties often arise in accounting for land used illegally for waste dumps, landfills, tailing pits and refuse heaps. The period of reporting is 10 years.

15. **Internationally agreed methodologies and standards:** The United Nations Food and Agriculture Organization (FAO) is working on the harmonization of classification systems and databases to improve national and international land use information. This includes the development of definitions and protocols, a computerized land use database structure, and a broadly accepted structure of land use classifications.

Data sources and reporting

16. Data on land use in EECCA countries are generally available from government authorities responsible for land use planning and environmental protection and from statistical agencies, local authorities and various reports. EECCA countries reported data on land use to UNSD in response to the UNSD/UNEP Questionnaire on Environmental Statistics. FAO also collects country data.

References at the international level

- <http://www.un.org/esa/sustdev/natlinfo/indicators/isd.htm>
- <http://www.fao.org>

- http://themes.eea.eu.int/Environmental_issues/waste/indicators
- <http://themes.eea.eu.int/IMS/CSI>
- <http://www.unep.org>
- <http://www.oecd.org/env/>
- <http://unstats.un.org/unsd/environment/questionnaire2004.htm/>
- http://epa.gov/ncea/ROE_Indicators/
- http://unece.org/env/europe/monitoring/LandR_en.html

AREA AFFECTED BY SOIL EROSION

General description

17. **Brief definition:** Total land area and share of agricultural land affected by degradation through wind and water erosion.
18. **Measurement unit:** Area (km²) and percentage of agricultural land area affected.

Relevance for environmental policy

19. **Purpose:** The indicator provides a measure of the state of land in terms of the degree to which it is affected by soil erosion.
20. **Issue:** Soil erosion can be caused by natural soil and landscape characteristics (steepness of hills, types of soil, amount of precipitation) which are difficult to change, as well as by land use, which can be easily mitigated by terracing, creation of wind barriers (including forest plantations) and changes in factors such as the variety, thickness and age of vegetation. Land erosion is a natural phenomenon, which, however, tends to be greatly accelerated by human activity. In most cases, erosion results from unsustainable agricultural land use, large-scale farming and over-grazing, and inappropriate irrigation and water management. Systems of agricultural management are a primary factor affecting the quality of soil. In turn, erosion is an exemplary indicator of negative effects caused by unacceptable agricultural practices, which lead to declines in soil fertility and often to irreversible soil damage. The soil erosion indicator estimates the total territory of eroded soil, the nature of erosion and erosion dynamics (where long time-series are available), and it enables the planning of counter-erosion activities.
21. **International agreements and targets:** United Nations Convention to Combat Desertification (New York, 1994). The soil erosion indicator reflects the progress achieved at the national level in fulfilling the requirements of Article 10 of the Convention. While no specific targets have been defined, the goal should be to reduce the area and percentage of land affected by erosion and/or reduce the severity of erosion.

Methodology and guidelines

22. **Data collection and calculations:** Data are collected separately for total land area (excluding area under inland or tidal water bodies) and agricultural land (including land under scattered farm buildings, yards and their annexes, and permanently uncultivated land, such as

uncultivated patches, banks, footpaths, ditches, headlands and shoulders). Wind and water erosion (sheet, rill and gully) of soil can be measured as a net loss and applied to one of four categories: light, moderate, strong and extreme. Alternatively, erosion can be measured visually or derived on the basis of reduced productivity. These alternatives can also be applied to the same four categories, which are mutually exclusive. The four categories should add up to the total area affected. The soil erosion indicator does not take into account many important types of soil degradation, such as hardening, over-grazing, secondary salt pollution, and loss of fertility and biodiversity. It also does not take into account the effects of road construction and tourism. The soil erosion indicator should be assessed at least every five years.

23. **Internationally agreed methodologies and standards:** The UNECE adopted Standard International Statistical Classification for Land Use. The Global Assessment of Soil Degradation (GLASOD), developed by UNEP and FAO, provides definitions categorizing the extent of soil erosion. Wind and water erosion methodologies developed in the United States (Universal Soil Loss Equation) and some other countries may be also helpful. There is also a methodology for the creation of global and national soil databases (Soils and Terrain Digital Databases – SOTER). The Committee on Science and Technology of the United Nations Convention to Combat Desertification is currently developing relevant international standards.

Data sources and reporting

24. At the national level, data are collected by ministries of agriculture and statistical agencies. EECCA countries reported soil erosion data to EEA for the *Kiev Assessment* report and to UNSD in response to the UNSD/UNEP Questionnaire on Environmental Statistics. Soil and Terrain Digital Database of the International Soil Reference Information Centre (ISRIC); GLASOD; FAO global database.

References at the international level

- European Environmental Agency. *Assessment and Reporting on Soil Erosion*. Technical report N 94. (EEA, 2002)
- *Down to the Earth: Soil Degradation and Sustainable Development in Europe. A Challenge for Twenty-First Century*. Environmental Issues Series N6. (EEA/UNEP, 2000)
- Towards a strategy for soil protection. (EC, 2002)
- Assessment and reporting on soil erosion. (EEA, 2002)
- Grimm, M. et al. *Soil Erosion Risk in Europe*. (2002)
- United Nations Convention to Combat Desertification
- <http://www.un.org/esa/sustdev/natlinfo/indicators/isd.htm>
- http://lime.isric.nl/index.cfm?fuseaction=dsp_menu&mode=&menuid=2
- <http://www.fao.org/gtos/tems/index.jsp>
- <http://faostat.fao.org/default.jsp?language=EN>
- <http://www.unccd.ch>
- <http://unstats.un.org/unsd/environment/questionnaire2004.htm/>
- <http://themes.eea.eu.int/IMS/CSI/>
- http://www.unece.org/env/europe/monitoring/landR_en.html
- <http://www.unece.org/env/europe/monitoring/EnvMonRep/index.html>
- <http://www.oecd.org/env/>

DESIGNATED AREAS

General description

25. **Brief definition:** The indicator shows the country-designated total area of land, inland water and marine ecosystems that is protected by national instruments and the ratio of this area to the total area of the country. It is also broken down to demonstrate the extent and the proportion of the designated areas by Protected Area Categories of the World Conservation Union (IUCN).

26. **Unit of measurement:** Total area in km² and as a percentage of the total country territory as well as by IUCN category.

Relevance for environmental policy

27. **Purpose:** The indicator provides a measure of the response to the degradation of ecosystems in a country. It demonstrates the extent to which areas important for conserving biodiversity, cultural heritage, scientific research (including baseline monitoring), recreation, natural resource maintenance and other values are protected from incompatible uses.

28. **Issue:** Sustainable development depends on a sound environment, which in turn depends on ecosystem diversity. Protected areas, especially the full range of IUCN Protected Area Categories, are essential for conserving biodiversity and also for contributing to sustainable development. According to the IUCN, territories intended for the protection and maintenance of biodiversity and natural resources, as well as historical-cultural resources related to them, should be governed by means of legal or other effective measures. In accordance with the main purpose of management, protected areas are divided into six categories of exposure to human interference, from complete non-interference to relatively strong interference.

29. **International agreements and targets:** The Convention on Biological Diversity (CBD) aims at the establishment and maintenance (by 2010 for terrestrial areas and by 2012 for marine areas) of comprehensive, effectively managed and ecologically representative national and regional systems of protected areas. Recommendation 16 of the Fourth World Congress on National Parks and Protected Areas (Caracas, 1992) establishes a target of 10 per cent protected areas for each biome (major ecosystem type). The European Environment Ministers in Kiev in 2003 called for the establishment of a pan-European ecological network by 2015. At the EU level, the target is to have a Natura 2000 network completed on land by 2005, marine sites by 2008 and management objectives for all sites agreed and instigated by 2010. In the European Union, Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora lists habitat types to be protected in EU Member States.

Methodology and guidelines

30. **Data collection and calculations:** It is necessary to have maps of designated areas and inventories of all protected areas of the country showing their location, size, date of establishment and protection regime in accordance with national legislation and relevant

international requirements. For inter-country comparisons, protected areas should be also grouped by the IUCN categories. The monitoring is done on an annual basis.

31. **Internationally agreed methodologies and standards:** The IUCN defines six management categories of protected area in two groups. Totally protected areas are maintained in a natural state and are closed to extractive uses. They comprise Category I, Strict Nature Reserve/Wilderness Area; Category II, National Park; and Category III, National Monument. Partially protected areas are managed for specific uses (e.g. recreation) or to provide optimal conditions for certain species or communities. They comprise Category IV, Habitat/Species Management Area; Category V, Protected Landscape/Seascape; and Category VI, Managed Resource Protected Area. The methodology is increasingly used for land ecosystems, less so for marine ecosystems, and least for inland water ecosystems. Inland waters are usually lumped with land in a terrestrial classification. The methodology for this indicator has not been standardized.

Data sources and reporting

32. EECCA Ministries of Environment generally collect this data and submit it to statistical offices. In cooperation with the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC), IUCN's World Commission on Protected Areas compiles the United Nations List of Protected Areas, which provides the name, IUCN category, location, size, and year of establishment of all protected areas which meet the IUCN definition, regardless of size and whether or not they have been assigned an IUCN category for all countries. This information is also included in the World Database on Protected Areas. The European Nature Information System, managed by the European Topic Centre on Biological Diversity (ETC/BD in Paris) for the European Environment Agency (EEA) and the European Environmental Information Observation Network (EIONET), covers, in particular, data on habitats and sites compiled in the framework of Natura 2000 (the EU Habitats and Birds Directives).

References at the international level

- Convention on Biological Diversity;
- Guidelines for Protected Area Management Categories. CNPPA with the assistance of WCMC. International Union for the Conservation of Nature and Natural Resources (IUCN), Gland, Switzerland; Cambridge, UK, 1994. 261 p. ISBN 2-8317-0201-1;
- Parks for Life: report of the IVth World Congress on National Parks and Protected Areas. IUCN - The World Conservation Union, Gland, Switzerland. Dinerstein, Eric, David M. Olson, et al. 1995;
- 2003 United Nations List of Protected Areas. IUCN, Gland, Switzerland & Cambridge, UK & UNEPWCMC, Cambridge, UK. Chape, Blyth, Fish, Fox & Spalding (compilers) 2003;
- Ecosystems and Human Well-being: A framework for assessment. Millennium Ecosystem Assessment, 2003. 245 p. ISBN 1-55963-403-0.;
- Benefits Beyond Boundaries: Proceedings of the Vth IUCN World Parks Congress. IUCN Gland, Switzerland & Cambridge, UK. 2005;
- <http://www.un.org/esa/sustdev/natlinfo/indicators/isd.htm>
- <http://www.biodiv.org/>
- www.wcmc.org.uk/parks/index.htm
- www.iucn.org/themes/wcpa/index.html

- www.wcmc.org.uk/protected_areas/data/un_97_list.html
- <http://sea.unep-wcmc.org/wdbpa/download/wdpa2004/index.html>
- <http://eunis.eea.eu.int/sites.jsp>
- <http://www.world-national-parks.net/>
- <http://themes.eea.eu.int/IMS/CSI/>

FORESTS AND OTHER WOODED LAND

General description

33. **Brief definition:** The indicator shows total area of forest and other wooded lands, ratio to total country area, and share of different categories of forests and other wooded lands by naturalness.

34. **Unit of measurement:** Square kilometres or thousand hectares for total, and percentage for share of forests and wooded land, and by category of designated use.

Relevance for environmental policy

35. **Purpose:** The indicator provides a measure of the state of forest and other wooded lands in a country and shows the trends in use for environmental purposes.

36. **Issue:** Forests are among the most diverse and widespread ecosystems on earth and have many functions: they provide timber and other products; deliver recreation benefits and ecosystem services, including regulation of soil, air and water; are reservoirs for biodiversity and act as carbon sinks. Overexploitation, fragmentation, degradation of environmental quality and conversion of other types of land uses threaten many forest resources. The impact from human activities on natural forest growth and regeneration raises concern. The indicator gives insights into quantitative and qualitative aspects of forest resources and presents averages that may conceal important variations among forest and other wooded lands.

37. **International agreements and targets:** Many other international agreements deal with forests within the context of natural resources and environment conservation, for example, the Convention on International Trade in Endangered Species (CITES), the Convention on the Conservation of Wetlands of International Importance (Ramsar Convention), the Convention on Biological Diversity, the Convention on Climate Change and the Convention to Combat Desertification. The United Nations Conference on Environment and Development adopted the Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests (the Forest Principles). There are no international targets. Several countries have set national targets for the extent of their forest area, either in absolute values or as a percentage of the total land area of the country.

Methodology and guidelines

38. **Data collection and calculations:** In data collection and calculations, relevant definitions established by FAO for its Global Forestry Resources Assessments and by the Ministerial Conference on the Protection of Forests in Europe (MCPFE) should be used. This relate to definitions of **forest** and **other wooded land** as well as definitions of forest and other wooded land whose primary function is designated as **protection of soil and water, conservation of biodiversity** and **social services** (recreation, tourism, education and/or conservation of cultural/spiritual sites). Other relevant definitions include **primary forest/other wooded land** (forest/other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed), **protective plantation** (stands of introduced species established for provision of environmental services, such as soil and water protection, pest control and conservation of habitats of biological diversity; areas of native species characterized by few species, straight tree lines and even-aged stands) and **semi-natural forest/other wooded land** (areas under intensive management where native species are used and deliberate efforts are made to increase/optimize the proportion of desirable species, thus leading to changes in the structure and composition of the forest). The data are generally contained in national forest inventories and obtained by sampling ground surveys, cadastral surveys, remote sensing, or a combination of these. The frequency of evaluation is generally five years.

39. **Internationally agreed methodology and standards:** The UNECE/FAO Global Forestry Resource Assessment; The MCPFE guiding principles for use of the Pan-European Indicators for Sustainable Forest Management.

Data sources and reporting

40. In EECCA countries, Forestry Ministries or Agencies collect the relevant data and submit it to the FAOSTAT global multilingual database and the electronic database of the Expert Committee on Temperate and Boreal Forest Resources (TBFRA-2000) of FAO/UNECE.

References at the international level

- Temperate and Boreal Forest Resources Assessment of 2000 UNECE/FAO. Terms and definitions. UN. New York and Geneva, July 1997.
- Forestry Resources of Europe, CIS, North America, Australia, Japan, and New Zealand (of industrialized countries of temperate/boreal zones). UNECE/FAO contribution to the Global Forest Resource Assessment of 2000. Keynote speech. UN. New York and Geneva, 2000. (ECE/TIM/SP/17).
- Global Forest Resource Assessment: Updated version, 2005. Technical description of national reporting tables in the framework of OJIP-2005. Forest Resource Assessment Program. Working paper No.81. FAO. Rome, 2004.
- MCPFE Liaison Unit VIENNA. Background information for improved Pan-European indicators for sustainable forest management - MCPFE expert level meeting 7 – 8 October 2002, Vienna, Austria;
- Sustainable Forest Management Systems. Application of the pan-European criteria for sustainable forest management (Portuguese Standard, NP4406 2003) MCPFE, 2003.

- International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (UNECE/ICP Forests);
- <http://www.un.org/esa/sustdev/natinfo/indicators/isd.htm>
- <http://www.unece.org/trade/timber/fra/welcome.htm>
- <http://faostat.fao.org/faostat/collections?subset=forestry>
- <http://www.mcpfe.org/>
- <http://www.icp-forests.org/Index.htm>
- <http://themes.eea.eu.int/IMS/CSI/>
- <http://unstats.un.org/unsd/environment/questionnaire2004.htm/>
- <http://oecd.org/env/>
- <http://www.iisd.ca/forestry/unff/unff5/>

THREATENED AND PROTECTED SPECIES

General description

41. **Brief definition:** This indicator uses estimates of population trends for species, in total and by species group, that are threatened at the national and global levels and under protection in the country.

42. **Unit of measurement:** Number of species.

Relevance for environmental policy

43. **Purpose:** The indicator provides a measure of the state of the biodiversity in terms of number of threatened species and the relative effectiveness of national response measures to maintain the country's and global biodiversity.

44. **Issue:** It is recognized that biodiversity has intrinsic value and that biodiversity maintenance is essential for human life and sustainable development. Many species-level biological resources are currently at risk of modification, damage or loss. For many years, IUCN and other international organizations have been monitoring the extent and rate of biodiversity degradation by assigning species to categories of threat through detailed assessment of information against a set of objective, standard quantitative criteria. IUCN has developed a "red list" of globally threatened species. The 2004 edition lists a total of 15,589 species. Countries are developing red lists of species that are threatened at the national level and are establishing appropriate protection regimes for these species. Some of the globally threatened species present in EECCA may not be classified as threatened at the national level. Nevertheless, countries have a strong responsibility for the care of these species even though they are not yet threatened on their territories. To what extent national policies on nature and biodiversity reflect this responsibility is shown by the information that the indicator provides on the total number of globally threatened species that are present and protected in the country.

45. **International agreements and targets:** This indicator is relevant to the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention

on the Conservation of European Wildlife and Natural Habitats (the Bern Convention), which lists species that must be protected. The Convention on Biodiversity aims to reduce the rate of biodiversity loss by the year 2010. The Ministers of Environment of the European States participating in the process of the Pan-European Biological and Landscape Diversity in 2003 reinforced their objective to halt the loss of biological diversity at all levels by the year 2010. The target implies not only that species extinction must be stopped but also that threatened species must be shifted to a better status.

46. In the European Union, Council Directive 79/409/EEC on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora list relevant species under legal protection.

Methodology and guidelines

47. **Data collection and calculations:** Lists of each group of threatened and protected species established in the country, and by IUCN for globally threatened species, serve as a basis for data collection. There may be differences between the number of threatened species and the number of species under protection, as the latter may include species protected under relevant multilateral environmental agreements or because of their presence on the *IUCN Red List of Threatened Species*. It is useful to have a break down for the latter species when presenting the resulting data. The number of species should be counted by species group (animals: invertebrates, freshwater fishes, reptiles, amphibians, birds and mammals; vascular plants). Taxonomic problems and the incomplete adequacy of the IUCN may list hinder proper maintenance of general accounting for invertebrates. Estimates for each species group should be done at least every five years.

48. **Internationally agreed methodologies and standards:** The *IUCN Red List* is the world's most comprehensive inventory of the global conservation status of plant and animal species. Classification into the categories for species threatened with extinction (Vulnerable, Endangered, and Critically Endangered) is done using a set of five quantitative criteria that form the heart of the system.

Data sources and reporting

49. At the national level, data are available from ministries of environment, agencies dealing with protected areas and statistical agencies. The Species Database of UNEP-WCMC provides detailed information on species of conservation importance. UNEP-WCMC maintains the CITES Trade Database. The European Nature Information System managed by ETC/BD covers data on species compiled in the framework of Natura 2000 and other relevant instruments.

References at the international level

- 2004 IUCN Red List of Threatened Species: A Global Species Assessment. Edited by Jonathan E.M. Baillie, Craig Hilton-Taylor and Simon N. Stuart. ISBN: 2-8317-0826-5;
- Categories and criteria of the World Red Book of the International Union for Conservation of Nature and Natural Resources (IUCN) (version 3.1);

- Global Biodiversity: Status of Earth's Living Resources. Compiled by World Conservation Monitoring Centre in collaboration with The Natural History Museum, London, and in association with IUCN, UNEP, WWF, and WRI. Chapman & Hall, London, 1992 - 585 p.;
- World Atlas of Biodiversity. UNEP-WCMC; Publisher University of California Press, 2002. - 340 p. ISBN: 0-520-23668-8;
- European Red List of Globally Threatened Animals and Plants, 1991 (E/ECE/1249 - ECE/ENVWA/20) (Sales No. 91.II.E.34);
- Code of Practice for the Conservation of Threatened Animals and Plants and Other Species of International Significance, 1992 (ECE/ENVWA/25-Sales No.92.II.E.16);
- <http://www.redlist.org/>
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- <http://www.iucn.org/themes/ssc/>;
- <http://www.nature.coe.int/english/main/Bern/bern.htm>.
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- <http://themes.eea.eu.int/IMS/CSI/>
- <http://www.cms.int/>
- <http://www.cites.org/>

TRENDS IN ABUNDANCE AND DISTRIBUTION OF SELECTED SPECIES

General description

50. **Brief definition:** Changes in the number of various selected species within a given area (country, region or designated area).

51. **Unit of measurement:** Number of mature individuals or other relevant indicator of abundance within a given area, and percentage for trends.

Relevance for environmental policy

52. **Purpose:** The indicator provides a measure of the state of selected species and response measures to maintain biodiversity.

53. **Issue:** Many multilateral environmental agreements recognize that biodiversity has an intrinsic value and that biodiversity maintenance is essential for human life and sustainable development. Because of high economic interest, many biological resources at the gene, species and ecosystem level are currently at risk of modification, damage or loss. The indicator shows the situation for populations of representatives of fauna and flora that belong to groups of species that are of major resource relevance and are important from the point of view of biodiversity conservation ("selected species"). The indicator will help decision makers to balance economic interests with biodiversity protection (especially when issuing hunting and forest harvest licenses), and to maintain balance within ecosystems.

54. **International agreements and targets:** This indicator is relevant to the Convention on Biodiversity, the Bonn Convention, CITES and the Berne Convention. The Convention on

Biodiversity aims to reduce the rate of biodiversity loss by the year 2010. The Ministers of Environment of the European States participating in the process of Pan-European Biological and Landscape Diversity in 2003 reinforced their objective to halt the loss of biological diversity at all levels by the year 2010. In the European Union, Council Directive 79/409/EEC on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora are also relevant.

Methodology and guidelines

55. **Data collection and calculations:** The following categories of species might be considered as “selected species” when developing a monitoring programme:

(a) **Keystone species:** Taxons whose impact on the ecosystem or community studied is disproportionately large relative to its abundance. The loss of these species will significantly affect the population sizes of other species in the ecosystem, potentially leading to further species loss (“cascade effect”).

(b) **Species of international significance:** Examples are species for which a country accounts for a significant proportion of the global or European range or population.

(c) **“Flagship” species:** These are taxons of particular intrinsic (cultural and historical) appeal to the citizens of the country as a whole or its regions.

(d) **Endemic species:** Any area contributes to global biodiversity by the overall number of different species within it and by the proportion of species that do not occur anywhere else (are endemic to the area). Conservation of endemic species, particularly those sharing a discrete geographic area, can be an effective way to maintain global biodiversity levels.

56. Information on species abundance should be collected through the consistent long-term application of an appropriate survey technique that is widely accepted by the scientific community. Retrospective population data can be obtained through review of published literature, including previous field study reports, to find material that is appropriate for comparison with the methodologies currently in use. While it is usually impossible to count every individual within a population or area, knowledge of habitat requirements and species population density in sample areas, coupled with data on climate, altitude, soil type and/or vegetation cover can be used to estimate population size in the area of interest. In many countries, a geographic information system (GIS) is commonly used to analyse the spatial data. It is important to verify population size predictions through fieldwork.

57. Quantity trends are predominantly determined based on the aggregate of cyclic fluctuations. They show the aggregate of habitat conditions, protection and efficient use of biological resources.

58. The indicator is calculated separately for every type. For species for which the aggregate absolute quantity is calculated, the following formula can be used to calculate the quantity trend indicator ($IN_{sp.}$) in percent:

$$IN_{sp.} = \ln(N_y) \times 100 / \ln(N_{max})$$

where N_y is the absolute quantity in a given year and N_{max} is the maximum known absolute quantity that serves as a reference point.

59. For species for which in the country there are only assessments of absolute or relative quantities in observation territorial units, the reference point for each observation territorial unit is the assessment of the quantity in the year the monitoring was introduced. Calculation of a subindicator ($SIN_{sp.}$) for a certain species is done for each observation territorial unit using the same formula. Then the geometric average of available assessments $SIN_{sp.}$ calculated for each year becomes the indicator.

60. **Internationally agreed methodologies and standards:** No universally agreed methodology currently exists. EEA is currently considering abundance variation trends over years for farmland, woodland, park and garden birds as well as distribution variation trends over 20–25 years for butterflies. WCMC/UNEP and World Wide Fund for Nature (WWF) have designed and implemented a system to generate indicators on biodiversity change over time, principally at the global or continental level.

Data sources and reporting

61. In EECCA, data are in relatively short supply. Some data that may be suitable as a basis for this indicator are collected by central environmental institutions, state statistics bodies, academic institutions and nature conservation associations. At the international level, BirdLife International maintains a database on farmland birds and on trends involving woodland, park and garden birds, and Dutch Butterfly Conservation maintains a database on trends involving butterflies.

References at the international level

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