The mission of the European Platform for Biodiversity Research Strategy (EPBRS) is to ensure that research contributes to halting the loss of biodiversity by 2010.

RECOMMENDATIONS OF THE WORKING GROUP ON

THE DESIGN OF NATIONAL AND EUROPEAN BIODIVERSITY INDICATORS

EUROPEAN PLATFORM FOR BIODIVERSITY RESEARCH STRATEGY

Meeting under the Greek Presidency of the EU
Lesvos, Greece, 23rd – 26th May 2003

"Not everything that can be counted counts, and not everything that counts can be counted."
- Albert Einstein

To gain the knowledge necessary to halt biodiversity loss by 2010, high priority is placed on research to:

1. develop theory that can be used to produce biodiversity indicators including theory relating to the use of indicators at different scales;
2. improve our understanding of the impact of major drivers, pressures, responses and policy objectives on biodiversity in order to improve the reliability of driver, pressure and response indicators;
3. identify or develop driver, pressure, state and response indicators that are appropriate to measure the effectiveness of major policies and measures relevant to the conservation of biodiversity and its sustainable use;
4. determine what sensitivity of indicator is appropriate for a stated purpose understand and therefore define the goals of monitoring and the appropriate scale and intensity to provide necessary data, with particular emphasis on the need for the detection of critical changes in the state of biodiversity or the impact of drivers, pressures and policy responses;
5. identify and develop indicators that will show when limits to acceptable variation in, for example, species (conservation) status or habitat integrity are exceeded or are likely to be exceeded within a critical time period;
6. develop indicators to assess species status and habitat condition in dynamic communities and ecosystems (including those in a process of natural succession);
7. develop indicators that determine the status and trends in genetic variability in particular species;
8. develop indicators to determine the status and trends in ecosystems and landscapes;
9. understand how indicator baselines can be developed, with particular emphasis on the use of the use of historical data to provide a baseline for comparison with current measurements and the use of retrospective models to establish baselines;
10. understand how indicators (such as the Natural Capital Index) can be developed from disparate data sources;

11. design new or develop existing monitoring networks to provide data for indicators and, in more restricted but more intensively studied networks of sites, to permit their validation;
12. validate indicators establish their spatial and temporal resolution, sensitivity, accuracy and precision;
13. assess the effectiveness of indicators in meeting the needs of policy-makers and other stakeholders;
14. validate and assess the policy relevance of existing indicator systems for the Acceding and Candidate Countries, and, where necessary, develop new indicators for the enlarged European Union.
15. investigate how indicators can help to construct, provision and validate models, including the development of biodiversity scenarios;
16. develop a dynamic database for biodiversity indicators and associated data and information (e.g. historical data, summary of research on validation) to allow users to identify indicators for particular purposes.

The above research priorities stemmed in particular from the following considerations:

- The measurement of status and trends in biodiversity is an essential element of objective and science-based programmes for the conservation and sustainable use of biodiversity. It is particularly important where specific political targets have been set, e.g. the Göteborg commitment to halt the loss of biodiversity by 2010;
- Taxonomic research, as a basis for describing, documenting and cataloguing biodiversity, continues to reveal thousands of new species every year;
- Biodiversity is inherently hugely complex and its status and trends cannot be measured exhaustively[1]. Indicators, or surrogates that can estimate status and trends more efficiently, faster or at lower cost than more complete inventories, are therefore essential elements of strategies for managing biodiversity;
- Species respond to changes in their environment in their own way. For this reason few indicator species are known that track changes to wider elements of biodiversity in a satisfactory way. However, indicators can be found or developed that track selected facets of biodiversity;
- The links between components of biodiversity that combine to generate ecosystem processes are typically both highly complex and weak; useful indicators cannot be found to track systems that are themselves poorly understood;
- Biodiversity and its conservation and sustainable use gives rise to many policy issues, most of which need their own custom-built indicators to measure some specific aspect of biodiversity for some clearly-defined purpose[2];
- Biodiversity indicators must be individually designed for a specified and defined purpose;
- Indicators contribute to measurement systems[3] with clear objectives and clear bounds in time, space and scope;
- The same set of drivers and associated pressures of biodiversity change operate throughout the world[4], but their relative importance to any given ecosystem is local. To be of use to policy makers, each indicator should ideally be sensitive to changes in biodiversity resulting from one particular driver or pressure;

- Indicators of biodiversity in Europe should take into account the differences in biodiversity in the major European biomes[5], the terrestrial, freshwater and marine environments, and the soil;
- Indicators should be designed in 4 steps: (1) define the goals of monitoring biodiversity, (2) define what elements of biodiversity are to be assessed, (3) define the targets for that element, (4) identify suitable indicators to measure progress towards the targets;
- The choice and design of indicators strongly influences subsequent policy, monitoring, and research programmes;
- Sets of national and European indicators should be designed such that, taken together, the set is relevant to all of the three aims of the CBD[6], to the objectives of the Birds and Habitats and Water Framework Directives, to the Göteborg[7] and WSSD targets to halt or reduce the loss of biodiversity, to the EU Biodiversity Strategy[8] and its biodiversity action plans, and to the 6th Environmental Action Programme[9];
- Biodiversity indicators are sometimes proposed or adopted because they are easy to measure, are interesting, are top predators, or because an influential section of the public thinks they should be conserved; indicators are sometimes adopted because related time-series data are available, although the data were collected for another purpose. These indicators should be critically assessed and if shown to be unsatisfactory they should be phased out and replaced by purpose-built biodiversity indicators;
- Indicators should be developed with those who will use them. The development of each national indicator will normally imply the involvement of environmental scientists and policy makers, but frequently also representatives of relevant industry, educators, and economists;
- A voluminous scientific and science-policy literature on the subject of indicators includes a key review paper "Indicators, Monitoring and Clearing-House Mechanisms: tools for policymaking and awareness raising" (STRA-CO (2002) 44 28)[10] that was prepared for the 6th meeting of the Council for the Pan-European Biological and Landscape Diversity Strategy (Budapest, 24-28 February 2002) and other publications by, for example, OECD;
- To date, very few indicators have been scientifically validated or their effectiveness in meeting the needs of policy makers and other stakeholders assessed.

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[1] As an obvious example, we do not even know what proportion of species are known to science. Some groups of organisms such as teleost fish and flowering plants are well known. Globally, however, despite two centuries of effort, taxonomists have probably named between 1 and 20% of living species. Our understanding of both genetic diversity and ecosystem processes is several orders of magnitude smaller.

[2] As an example, indicators might be developed to measure the effectiveness of legislation for nature protection, or to estimate ecological resilience, to monitor the impact of plans to integrate biodiversity concerns into production systems, to monitor trends among endangered species, or to track the status of biogeographically characteristic ecosystems.

[3] Such systems should themselves be comprehensive, address the main concerns of the users, track **d**riving forces of biodiversity change, **p**ressures on biodiversity, **s**tatus of biodiversity, **i**mpacts of the current status on ecosystem goods and services, and **r**esponse of society (DPSIR); be comparable over time and between sites and countries, and use a set of indicators that is as economical as possible.

[4] Pressure of major significance include habitat loss, habitat fragmentation (or connection in aquatic ecosystems), changes in land use, changes in climate, pollution, changes in concentrations of atmospheric constituents (including nitrogen in deposable form, carbon dioxide and tropospheric ozone), biotic introductions, over-harvesting, over-exploitation, and changes in environmental chemicals or human activities that lead to differential changes in patterns of reproduction, dominance, behaviour and survival.

[5] Natural European biomes include marine (benthic and pelagic), coastal, freshwater aquatic (lakes, running water and wetlands), forest (boreal, temperate, and, in the ultra-peripheral regions, tropical) grasslands, mountains, Mediterranean and arctic. Major anthropic systems are agricultural, silvicultural, and urban.

[6] To ensure the conservation of biological diversity, the sustainable use of biological resources and the equitable sharing of the benefits of genetic resources.

[7] "halting biodiversity decline with the aim to reach this objective by 2010". Presidency Conclusions, Göteborg European Council 15 and 16 June 2001 (http://www.eu2001.se/static/pdf/eusummit/conclusions_eng.pdf)

[8] "to reverse present trends in biodiversity reduction or losses and to place species and eco-systems, which includes agro-ecosystems, at a satisfactory conservation status, both within and beyond the territory of the European Union." Communication of the European Commission to the Council and to the Parliament on a European Community Biodiversity Strategy (COM (98) 42 final)

[9] "To protect and where necessary restore the structure and functioning of natural systems and halt the loss of bio-diversity both in the European Union and on a global scale." Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the sixth environment action programme of the European Community 'Environment 2010: Our future, Our choice' (COM (2001) 31 final)

[10] http://www.strategyguide.org/docs/budapest/STRA-CO%20(2002)%2044.doc