

RECOMMENDATIONS TO ECE GOVERNMENTS ON ECOSYSTEMS-BASED WATER MANAGEMENT

prepared at the Seminar on Ecosystems Approach to Water Management, held in Oslo (Norway) in 1991, and adopted by the Senior Advisers to ECE Governments on Environmental and Water Problems at their fifth session in March 1992'

Growing awareness of the deterioration of aquatic ecosystems has led many ECE countries to develop and implement integrated policies and strategies to resolve the complex and interrelated management problems of water resources as an integral part of the environment, and to overcome the management of water resources in isolation from other ecosystems components, namely land, air and living resources. Ecosystems-based water management, as a holistic way of viewing, planning and managing the ecosystem components, promotes sustainability of these components and the environment as a whole. This multimedia approach, which is geographically comprehensive, aims at restoring, maintaining and improving the conditions and characteristics of aquatic ecosystems and thus water resources. It forms a framework for decision makers, managers and planners to cooperate in devising integrated ecosystems-oriented strategies encompassing, *inter alia*: rational use of water; prevention, control and reduction of surface water and groundwater pollution from both point and non-point sources; the conservation and restoration of biotic communities, including sustainable fishery and aesthetic qualities; the protection of natural habitats on shores, marshes and wetlands together with their associated flora and fauna; and provision of the enhanced health and welfare for residents of catchment areas.

In the light of these considerations and with a view to providing guidance in the formulation of ecosystems-based, integrated policies and strategies of water management, and in order to strengthen international cooperation,

it is recommended that:

1. The application of general principles of the ecosystems-based water management should be promoted in day-to-day water planning and catchment management, taking into account the role of water as a deci-

factor in aquatic ecosystems. Such action should aim, *inter alia*, at:

(a) Furthering all measures and behaviours necessary to restore, maintain and improve conditions of aquatic ecosystems;

(b) Promoting the conservation of aquatic ecosystems providing for the sustainable use of water resources in ways that meet the exigencies of aquatic ecosystems and various human needs, individually and collectively, without compromising the ability of future generations to meet their needs;

(c) Accelerating the healing of damaged ecosystem components by improving water quality, restoring, rehabilitating and protecting biotopes and habitats of natural communities of indigenous species of plants and animals, as well as restoring hydraulic systems functions;

(d) Fostering cooperation in good faith of all people living within the respective ecosystem in order to achieve mutual objectives consistent with the above.

2. The whole catchment should be considered as the natural unit for integrated, ecosystems-based water management. As a first step towards achieving management of whole catchments, protection should be given to strips of riparian vegetation (important for wildlife habitat, nutrient interception, bank stabilization, temperature conditions, allochthonous food supply, etc.), any adjacent semi-natural wet habitat intimately linked with the water body and hydrologically dependent on it (e.g. marshland, fens or wet woodland), and non-wetland habitats adjacent to the water body, provided they contribute significantly to sustaining fauna associated with the water body.

3. Pragmatic, phased actions should be applied to ensure that at least certain aquatic ecosystems and their parts (e.g. the rivers' corridor, including riparian strips and flood-plain habitats) are adequately managed. Criteria for evaluations and subsequent classifications of aquatic ecosystems may include, *inter alia*, size, diversity (of habitats and species), naturalness, representativeness, rarity, fragility, potential value and intrinsic appeal.

³ At their sixth session in March 1993, the Senior Advisers adopted the Guidelines on the Ecosystem Approach in Water Management. These were published in the Water Series No. I, ECE/ENVWA/31.5ive

4. The elaboration of classifications of aquatic ecosystems and an ecological frame of reference, as well as formulation of priority zones for restoring, maintaining and improving their conditions, should be recognized as an important aspect of water management. The riparian countries should undertake to harmonize their approaches to the elaboration of such classifications with regard to transboundary waters.

5. The feasibility of restoring, maintaining and improving ecologically natural conditions in the catchment area or its parts should always be considered. Every effort should be made to protect or preserve those ecosystems which are relatively undisturbed, like those of mountain lakes, nature parks and heritage areas.

6. Water-management objectives should include a set of ecological quality and quantity parameters depending on the ecological characteristics and uses of the water. These objectives should be set at a safe limit according to the precautionary principle which requires that appropriate measures be taken before exhaustive scientific evidence to justify these could be assessed. Water-management objectives should be attained through the combination and integration of measures of water management, prevention of pollution and of misuse of water resources, as well as nature-conservation measures including restoration of degraded habitats.

7. Principles of ecosystems-based water management should serve as the basis for relevant legal acts, agreements, policy statements and regulations. Responsibility for the enforcement and monitoring of compliance should be clearly defined.

8. The practical application of ecosystems-based water management requires appropriate institutional arrangements, improved expertise and strengthened coordination of water-management activities carried out in key water-related sectors, including water supply, pollution control, hydropower, transportation, industry, agriculture, forestry, tourism and recreation. Governmental institutions should involve private sector organizations, landowners and public interest groups, both in the preparatory and the implementation process of the ecosystems-based action plans, in order to reach broad consensus, and should encourage concerted action by policy makers, industrialists, farmers, planners, water managers, scientists and the general public.

9. Nationwide water management master plans should be considered as important instruments in ecosystems-based water management. Riparian countries should incorporate ecosystems considerations into national water management plans for the respective parts of trans-boundary waters and/or into multilateral action plans for these waters.

10. Particular attention should be given to the integration of land-use planning and water-management planning into integrated, ecosystems-based planning. All activities in the catchment area which are likely to cause significant adverse effects on aquatic ecosystems in terms of water quality and quantity, biological communities and the integrity of aquatic ecosystems, should be subject to environmental impact assessment (EIA) and authorization procedures. EIA should also be applied on an international scale, in particular with regard to activ-

ities with a potential transboundary impact on transboundary waters.

11. Natural-resource accounting systems should be further developed with a view to placing economic values on components of aquatic ecosystems, such as water, wildlife and wetlands, aimed at ensuring that the value of healthy ecosystems is brought into the realms of cost-benefit and cost-effectiveness calculation. The development of economic assessment methods that provide for an interdisciplinary and intersectoral analysis of long-term costs and benefits of measures taken within the framework of an ecosystems-based management plan should be promoted.

12. Since one of the major reasons for conserving, restoring, maintaining and improving the conditions of aquatic ecosystems is to enable the survival of the natural communities of flora and fauna appropriate to the particular stretch of the water in question, full account should be taken of the ecological conditions of the water. Methodologies for comprehensive evaluation of aquatic ecosystems should be developed and harmonized at national and international levels. Such methodologies should aim at determining the current state of the ecosystem in question and the processes currently dominating its behaviour, as well as at identifying and forecasting short- and long-term changes in the ecosystem, including the evaluation of human impacts.

13. Ecosystems assessment should be based on integrated criteria in terms of water quality and quantity as well as flora and fauna. Intensive and continuous chemical analysis of water quality, analysis of flow regimes, assessments of habitats, communities, sources and scales of pollutants and mass-balance derivations should be undertaken in order to provide reliable information. Where appropriate, analogues and indicators of community function should be applied in order to avoid reliance on costly and tedious ecosystem audits. Development of relevant simulation models should also be fostered. Computerized assessments should be further investigated and tested.

14. Data for ecosystems-oriented water management should be based upon or developed from existing observation networks, supplemented, where necessary, by integrated monitoring programmes in order to provide for comprehensive assessments of ecosystems conditions, including interlinkages between abiotic and biotic factors operating within ecosystems. Such programmes should take into account all ecosystems users, including flora and fauna, food-web relationships and trophic levels, as well as natural communities and habitat requirements.

15. Particular attention should be given to the harmonization of sampling and data-processing methodologies, as well as *in situ* and laboratory analyses aimed at verifying and validating data. Development and application of bio-assessment methods, including rapid bio-tests, as well as sampling and processing analysis using advanced technology, should also be promoted, as well as the systematic application of these methods.

16. Compilation of map atlases should be undertaken to highlight the ecological aspects of water management. Such atlases should include, *inter* maps of water supply and use, maps of ecologically safe flow in rivers and ecologically safe water level in lakes, maps of water construction facilities, and maps of availability of fish and game stocks, etc.

17. The research and development strategy on ecosystems-related problems should be shifted from a piecemeal, issue-oriented approach of solving particular water management problems to a holistic approach of developing strategies for the integrated management of air, water, land and living resources within an ecosystem. This would require refined scientific knowledge on, in particular, habitat requirements and bounds of species,

as well as the resilience of native animal and plant communities to man-made disturbances, like water abstraction, low-level organic pollution, nutrient enrichment, fish stock management, flow regulation, recreation pressures, sediment input or vegetation removal. The elaboration of glossaries of terms used in ecosystems-based management should be undertaken.

18. Ecosystems-oriented education and training should be promoted aimed at raising awareness on ecosystems considerations in institutions of general education; developing subject- and problem-oriented learning modules, as well as interdisciplinary learning modules, for trainees, employees and managers; and supporting pilot projects.