RECOMMENDATIONS TO ECE GOVERNMENTS ON THE PROTECTION OF INLAND WATERS AGAINST EUTROPHICATION

as adopted by the Senior Advisers to ECE Governments on Environmental and Water Problems at their fifth session in March 1992

Although over the last decades significant efforts have been made in ECE countries to prevent, control and reduce the emissions of nutrients from point and non-point sources into aquatic ecosystems, eutrophication of water bodies remains a serious problem in parts of the ECE region. The excessive loading of aquatic ecosystems with nutrients may result, *inter alia,* in severe water-quality problems in surface waters, marked changes in aquatic community structure, including loss of fish species of economic value, and hardships for water uses including economic and social implications. The integration of eutrophication control policies with pollution prevention, waste-water management and agricultural policies would promote protection of inland waters, including trans-boundary waters, and sustainable use of water resources.

In the light of the above considerations, and with a view to providing guidance to planners and decision makers in the formulation of national policies for eutrophication control and in order to strengthen international cooperation in this field,

it is recommended that:

1. Inventories of nutrient sources should be established and their contribution to the total load assessed. On the basis of this information, a decision should be taken on the reduction of phosphorus and nitrogen load from these sources, paying due account to the current water quality and the water-quality objectives established for the protection and maintenance of the intended water uses and aquatic ecosystems.

2. Water-quality objectives should include eutrophication-related water-quality parameters, such as nitrogen and phosphorus concentrations, chlorophyll concentration, water transparency and, if appropriate, oxygen-depletion rates. Riparian countries should jointly agree on water-quality objectives and appropriate gross reductions of their nutrient emissions into transboundary waters.

3. Measures for the reduction of nutrient loading from point and diffuse sources should be based on an integrated multisectoral approach.

4. Waste water from domestic and industrial sources, including waste waters from intensive livestock farming, should be subject to treatment. Small and medium-sized municipal sewage treatment plants should be upgraded for nutrient removal, where appropriate, at least to the secondary (biological) stage. Additional physico-chemical precipitation of phosphorus should be implemented, where necessary, at large municipal treatment plants and at small and medium-sized treatment plants where biological treatment is not sufficient to prevent eutrophication.

5. Appropriate measures should be taken in industry, where necessary, to reduce the phosphorus concentration in effluents or in the influent (raw sewage) to municipal treatment plants. Best available technologies should be used to remove nutrients during pre-treatment and treatment processes of industrial waste water. Research should be promoted aimed at improving process technologies, with a view to lowering the phosphorus output from industry, in particular from the food-processing and fertilizer industries.

6. Special attention should be devoted to the reduction or replacement of phosphates in detergents to reduce the phosphorus content of domestic sewage. All appropriate steps should be taken to encourage industries to develop phosphate substitutes that are harmless to the environment. Monitoring programmes should be adapted to analyse the fate of new chemicals likely to be introduced into sewage sludge and aquatic ecosystems as a result of the use of phosphate substitutes in detergents.

7. Effluent standards for phosphorus and nitrogen should be reviewed regularly in the light of up-to-date scientific knowledge, aquatic ecosystems' exigencies and new technological achievements.

8. Maximum concentration limits of nutrients in effluents from municipal treatment plants should be established in accordance with the size of the treatment plant; the higher the population equivalent of a treatment plant, the lower should be the maximum permitted concentration of nutrients in effluents. Maximum concentration limits of nutrients in effluents from industrial waste-water treatment plants should be established on the basis

of best available technology for phosphorus and nitrogen removal.

9. Codes of environmentally sound agricultural practice should be developed and harmonized on an international level. Such codes should aim at providing advisory services to farmers with a view to reducing discharge of nutrients from farmlands and improving the efficiency of the use of agricultural inputs.

10. Particular attention should be devoted to the development and application of environmentally sound agricultural operations, such as integrated manure management, techniques to fight erosion from agricultural land and less intensive application of chemical fertilizers and pesticides. Measures for the control of emissions of nutrients during agricultural production processes should be supplemented by the establishment of vegetation strips along watercourses and lake shorelines. Management agreements with farmers and information campaigns should also be promoted.

11. Remedial measures should be regarded as useful supplementary means of eutrophication control, particularly when emergency eutrophication symptoms arise in a water body of special concern. Biomanipulation should be regarded as the preferred and most effective treatment method. Impacts of remedial measures on the aquatic ecosystem functioning should be studied prior to application, in order to reveal and mitigate potential adverse side-effects.

12. In tributaries with low flow rates, additional measures should be applied, whenever possible, in order to reduce the direct transport of nutrients into lakes and reservoirs, taking into account the need to conserve existing

healthy ecosystems without risking their deterioration, an example being the reconditioning of the natural river bed with gravel layers.

13. The implementation of eutrophication-control measures should, where necessary, be supported by appropriate economic instruments, such as the introduction of emission charges on the basis of the nutrient concentration in effluents, the elimination of subsidies for resource-intensive practices, and the application of tax refund systems aimed at encouraging the reduced consumption of inputs (water, energy, fertilizers, pesticides, etc.) in agriculture. Regulations should be strictly enforced.

14. Monitoring and limnological surveys should be expanded and intensified with a view to: identifying water bodies affected by eutrophication, identifying all nutrient sources and their relative importance, assessing eutrophication control options and the effectiveness of control measures carried out.

15. Nutrient transport mechanisms through the air, soil and water should be studied further and models for the simulation of these transport processes and the response of water bodies to phosphorus-loading changes should be improved. Research should also be promoted on mechanisms underlying internal nutrient loading from sediments, in particular the influence of iron, alum and calcium contents on these mechanisms.

16. Public awareness should be enhanced in order to gain support for appropriate eutrophication-control policies, and public participation in the decision making process on eutrophication-control options should be promoted.