

# **RECOMMENDATIONS TO ECE GOVERNMENTS ON THE PROTECTION OF SOIL AND AQUIFERS AGAINST NON-POINT SOURCE POLLUTION**

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The maintenance of soil and groundwater quality by safeguarding them from pollution are clearly of both immediate and long-term concern in view of the economic and ecological functions of soil and groundwater. Until recently, the efforts of ECE countries had been concentrated mainly on the abatement of pollution from point sources, in particular industrial and municipal sewers. It is now being recognized, however, that the importance of pollution of soil and aquifers from non-point or diffuse sources is rapidly increasing, and that urgent and effective measures are needed to combat this type of pollution.

***The following recommendations were, therefore, formulated:***

1. The identification of pollution pathways which connect sources and corresponding recipients and the establishment of relations governing diffuse pollution processes should be the subject of continued and expanded research. The study of the evolution of pollutants in the unsaturated zone above the piezometric surface should be included in the research activities.
2. Governments should encourage basic and applied research into the toxicity of new products, the mechanisms of water, soil and plant contamination, as well as that of fluxes and stocks in addition to biodegradability of substances released into the environment. The consequences of agricultural practices for soil and groundwater contamination should be duly taken into account in research.
3. Special attention should be devoted by ECE Governments to the exchange of information at both the scientific and technical levels, in order to improve the dissemination of knowledge and to speed up the process of applying the results of research activities.
4. Setting up a comprehensive monitoring network for soil and groundwater pollution, as well as increasing research activities and designing a multidisciplinary programme with the participation of all sectors involved—agriculture, industry and the various agencies with environmental protection responsibilities—would substan-

tially mitigate the problem presently experienced.

5. Government-sponsored programmes should be implemented with a view to providing an assessment of the present state of non-point sources of pollution of soil and groundwater and as a means of evaluating and supervising control programmes. In regions where non-point source pollution of soil and groundwater by nitrate and pesticides has already been ascertained, these programmes should be given highest priority.

6. Governments should contribute towards a better understanding of the situation regarding non-point source pollution by, *inter alia*, establishing surveys and aquifer vulnerability mapping.

7. Educational campaigns should be launched to draw the attention of the general public to problems of soil and groundwater protection. In this context, the close interrelations between the different elements of ecosystems (air, water, soil, etc.) should be stressed.

8. Information campaigns should be launched by Governments with a view to increasing the awareness of farmers and foresters regarding the negative aspects of non-point source pollution created by their activities. In this context, methods such as codes of conduct should be developed and organizational structures implemented which would provide guidance and technical assistance to the professionals involved and to their advisers, in particular as concerns rational fertilization practices. These aspects should also be incorporated into the curricula and become part of the basic training.

9. Governments should widely apply economic incentives and disincentives to foster new environmentally sound technologies aimed at preventing soil and groundwater pollution and in order to rehabilitate resources where damage has been done.

10. Effective implementation of preventive measures, especially in catchment areas for drinking water, should be checked at regular intervals by official authorities as part of a comprehensive monitoring programme.

11. Special attention should be given by the competent authorities to prevention of non-point pollution from ani-

mal production. As, apart from the sanitary aspects, no economic factors seem to limit the size of production farms, the following elements should be borne in mind when designing and implementing relevant legal, regulatory and technical policy measures:

(a) Reservation of sufficient surface for spreading manure and liquid manure from animal production farms, with due regard to local pedological and climatic characteristics and taking into account the specific production methods;

(b) Provision for sufficient storage capacity for manure and liquid manure both in terms of volume and impermeability;

(c) Adoption of rational spreading schemes with due regard to crop needs and the uptake of nutrients by plants, so as to minimize leaching;

(d) Development of safe and economic methods for treatment or conditioning of manure and liquid manure for recourse when spreading has reached its limits.

12. Source-oriented controls, including, *inter alia*, facility design standards, permits, designation of disposal sites, effluent limitations and prescribed management practices, should be enforced as regulatory measures against pollution caused by diffuse urban sources in ECE countries. Leak detection and clean-up capability should be included in the design phase of all new facilities. Governments should encourage the adoption of product control measures, by means of restrictions on the sale and use of potentially hazardous materials.

13. Quality control of urban run-off should be performed prior to its entry into the sewer system or disposal into the soil or surface water bodies. The choice between separate and combined drainage systems for stormwater run-off should be made after careful analysis of local conditions in each catchment and municipality.

14. Specific preventive measures against pollution in waste disposal areas should include the following:

(a) Reduction of waste generation by utilizing more efficient industrial processes;

(b) Regulation of siting of waste disposal above vulnerable aquifers;

(c) Continuous monitoring of soil and groundwater quality in the associated aquifers.

15. ECE Governments should promote the adoption of design, construction and installation standards for underground storage tanks. Both new and old tanks should be subject to long-term, systematic monitoring.

16. Legal provisions for the safe handling, storage and transport of potentially hazardous materials should be adopted by ECE Governments, as source-oriented measures to prevent pollution associated with industrial and commercial activities.

17. Intensive research efforts should be envisaged by ECE Governments in order to determine the relative influence of edaphic, climatic and biotic factors in atmospheric deposition and their impact on soil and aquifers.

18. Abatement of pollution associated with acid rain

can be achieved by means of a drastic reduction in emissions containing acid-forming substances. The appropriate technical, legal and regulatory measures have to be intensified within the national as well as the international ECE framework.

19. In developing urban areas, communities should incorporate structural measures to reduce long-term urban run-off volumes, as well as provisions for erosion control on construction sites.

20. Integrated land-development and groundwater-protection planning should be aimed at promoting the well-being of the population and be coordinated with other sectoral planning activities.

21. Close cooperation should be established between competent administrative authorities dealing with land-use planning and development, rational use and protection of groundwaters, at the early stages of the planning process and at all levels. It would promote the arbitration of conflicting interests in sectoral planning.

22. Protection of aquifers against non-point source pollution should be integrated into general water-protection strategies with due regard to the specific characteristics of the groundwater cycle, diffusion processes, hydro-chemical regimes and response to natural and anthropogenic factors.

23. Land-development planning should play a coordinating role with regard to other land-use activities. Particular attention should be paid to environmental impact assessment of every planning project, and in particular to soil and groundwater protection concerns.

24. In cases of transboundary impact of land development on the quality of groundwater, interested States should provide each other with relevant information. Before implementing practical measures, specific attention should be paid to coordination of actions which may have an impact on mutual interest.

25. Particular attention should be paid to transboundary impacts of economic activities on groundwater quality. At present, there are only a few examples of effective coordination between transboundary land development and groundwater protection planning. An exchange of necessary information and bilateral and multilateral cooperation are needed to this end.

26. Local, regional and national bodies should promote the preparation of appropriate laws and regulations along with mechanisms for their enforcement which would encourage protection of soil and groundwater against non-point source pollution.

27. Groundwater protection strategies need an interdisciplinary approach. Therefore teaching programmes of relevant higher education institutes should be so adapted as to meet the future demand for highly qualified specialists in rational groundwater management.

28. The need to reserve ecological functions as a main element in water management considerations should be incorporated into policy options with regard to the protection of soil and aquifers against the hazards of non-point source pollution.

29. The polluter-pays principle is widely considered as an important tool of environmental policies. It should be applied also with respect to diffuse pollution in cases when an unquestionable link can be established between a pollution episode and its perpetrator. Whenever the cause-effect relationship cannot be established and, consequently, no polluter can be identified, the possibility of establishing special funds in order to reduce pollution should be studied.

30. Further options for financing preventive measures should be adopted where needed, such as the introduction of emission and effluent charges as well as progres-

sive tariffs for water abstraction and consumption. Furthermore, incentives to eliminate harmful substances at source should be implemented by means of financial support (e.g. low-interest loans).

31. In protecting soil and groundwaters against pollution from non-point sources, further cooperation should be promoted both on the bilateral and multilateral level, particularly within the framework of ECE, and include Governments, business circles, universities, research institutions, municipalities, etc.