Part Two

RECOMMENDATIONS TO ECE GOVERNMENTS ON SPECIFIC MEASURES TO PREVENT, CONTROL AND REDUCE GROUNDWATER POLLUTION FROM CHEMICAL STORAGE FACILITIES AND WASTE-DISPOSAL SITES

prepared by the Seminar on the Prevention and Control of Groundwater Pollution from the Storage of Chemicals and from Waste Disposal, held in Madrid, Spain, in 1995, and adopted by the Committee on Environmental Policy at its third session in May 1996

Recognizing the growing importance of protecting groundwater against contamination from industrial accidents, from the improper handling of substances that pose a hazard to water quality, from industrial and military sites, and leaky industrial pipes,

Conscious of the fact that groundwater damage has long-term effects and that existing groundwater damage, with the exception of pollution from sudden accidents, has arisen over long periods of time,

Commending the efforts already made by ECE countries to implement specific measures to prevent, control and reduce groundwater pollution,

Recalling decision E (44) of the Economic Commission for Europe, whereby it adopted the Charter on Groundwater Management,

Taking into account the 1988 Recommendations to ECE Governments on the protection of soil and aquifers against non-point source pollution, drawn up at the 1987 Madrid Seminar on groundwater,

Referring to the specific provisions of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992) regarding the protection of groundwaters and the restoration of damaged aquatic ecosystems, of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) to carry out environmental impact assessment procedures at an early planning stage for proposed activities likely to have a significant adverse impact on groundwater, and of the Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 1992) to prevent, prepare for, and respond to industrial accidents,

it is recommended that ECE Governments follow the recommendations set forth below:

General

Groundwater protection should be comprehensive, and not be limited to water-production areas. The water quality of unpolluted aquifers should be preserved. While taking into account the distinguishing features of groundwater as compared to surface water, the integrated management of groundwater and surface water should be promoted. The protection strategy should also call for the development and use of techniques to alleviate existing contamination.

To ensure coordinated groundwater policies, efforts should be made, where applicable, to concentrate overall responsibility for groundwater in a single authority.

The planning of new activities which could pollute groundwater should include all necessary preventive measures at the pollution source and containment measures.

The protection of groundwater should not rely on the self-purification capability of aquifers, unless this can be justified by specific local conditions and does not lead to long-term uncertainty or non-sustainability.

Clean-up priority should be given to those sites that threaten legally-protected aquifers and related ecosystems. Despite technical and economic difficulties, the necessary efforts should be made in areas with limited alternative water resources to restore aquifers rather than to abandon them or curtail their use. However, if the aquifer is extensively, severely or irreversibly polluted it may be unreasonable to aim for a complete groundwater clean-up.

Legislation should lay down separate requirements for precautionary and post-care groundwater protection. Precautionary standards are to be used to prevent future impairment. The standards for assessing post care are those established for the prevention of hazards to protected goods and/or resources, especially human health. Using a system of values based on a list of hazardous

substances, the authorities have to decide whether or not action should be taken.

Decision-making involves public participation. This requires a public that is informed about environmental matters, including the protection of groundwater. Information should be directed at all levels of society and not merely to those who are already aware of the situation, as is often the case. In particular, efforts should be made to address the younger generation, who are the decision makers of the future.

Prevention

All storage facilities should comply with the precautionary principle. The authorities should be notified of any storage facility for hazardous substances. For facilities with a significant risk potential, official licences should be required.

Storage facilities should be designed, installed, maintained and operated in such a way that there is no danger of groundwater pollution or of any other adverse impact on groundwater resources. Containers should comply with special standards and the type of construction, installation, cleaning and maintenance of the facility and the way it is monitored must be regulated. A licensing procedure should be followed to certify that the construction parts of the facility meet standards. In addition, the construction parts should be installed by specially qualified personnel. The installation firms should set up special quality-control systems.

A twofold safety principle is fundamental. Having two independent safety systems means that the facilities must be situated in an impermeable and stable collection area or that they must be equipped with double walls and mechanisms to warn of leaks.

Authorized experts should examine the storage facilities before these are put into operation, at regular intervals during operation, and after the facilities have been shut down. The operator should monitor the facility to ensure that its safety mechanisms function properly. Particular qualifications are required to monitor and clean the facility. Those carrying out maintenance and cleaning should also be required to set up special quality-control systems.

Landfills should be constructed in such a way that, even in the long term, possible leachate from deposited waste cannot pose a risk to groundwater.

Environmental impact assessment (EIA), hazard rating and technology assessment should be an integral part of the planning, design, construction, operation and maintenance of facilities for the manufacture, processing, storage, recycling and transport of chemicals and waste, as should an analysis of the potential impact of malfunctions and accidents within such systems. Particular attention should be given in EIA to the siting of facilities for the collection, storage and processing of substances and to the movement of pollutants from one part of the environment to another.

To further develop the legal and regulatory framework, efforts should be made at appropriate levels of Government to stimulate research and development on such issues as the distribution of hazardous substances in, and their effects on, groundwater; the movement of these substances between groundwater and surface water; and vulnerability of groundwater. Research anddevelopment on effective techniques for the prevention, control and reduction of groundwater pollution should also include methods for assessing damage and mechanisms for compensating for damage.

Assessment for rehabilitation

Polluters, government authorities and the public will accept to pay for the management of contaminated sites only if there is a clearly stated case-by-case assessment, taking into account the endangered receptors and uses. Consequently, instruments to assess and present results should be developed.

A site should be considered to require action only if it poses a hazard to a relevant good/receptor. The hazard should be assessed on the basis of the danger potential of the substance, its behaviour on the various exposure pathways and the expected exposure of the various receptors to be protected. Hazard assessments should take into account the current and future use of the groundwater.

To determine whether or not a hazard is present, one should show that a receptor has already been affected or that the probability of adverse impact within the foreseeable future is sufficiently great.

Formalized assessment models that take into account the criteria and/or parameters to characterize pollutants, sites and uses within surrounding areas are considered very useful. However, the outcome of model calculations should always be verified by an assessment commission which should include representatives of all parties concerned. Each case should be assessed individually, since the local geological, physical and hydrological conditions have a decisive influence on the need for treatment and on its extent.

Data collection and monitoring programmes should be tailored to the required information level, which is determined by the assessment goal (e.g. initial assessment, comparative assessment, detailed assessment). These programmes should use standardized sampling and laboratory procedures.

It would not be appropriate to set standards or quality classes to be achieved in groundwaters, because of the different natural conditions, human impact, and water uses that exist and the fact that many of the processes involved in the movement and breakdown of substances in the soil and in groundwater are not yet fully understood.

Therefore, a non-binding value system should be drawn up to help assess the degree of pollution and evaluate pollution loads. The system should not be applied schematically. It should include:

(a) Reference values which specify the natural background quality;

(b) Test values which represent warning levels. If they are not reached, no further measures are needed;

(c) Threshold values which represent action levels. As a rule, if these values are exceeded, further measures such as abatement, containment or rehabilitation should be undertaken to eliminate risks to goods and resources to be protected.

Goals for cleaning up contaminated sites range from mere hazard prevention required by regulations to the ecologically desirable restoration of the *status quo ante* or of an area's multi-functionality. The minimum goals should be to:

(a) Prevent health hazards wherever possible;

(b) Prevent strong ecotoxicological effects and other significant adverse effects on the environment;

(c) Restore the potential for different uses of water resources.

Remediation technology

Restoration measures should be selected according to the type of pollutants involved and the characteristics of the aquifer concerned. Particular attention should be given to soil pollution from substances that can move easily through groundwater. The affected soils should be cleaned up immediately to prevent further propagation within the subsoil and within the aquifer. This will reduce the costs of aquifer restoration in the long term.

Consideration should be given to a combination of different available techniques for containment and clean-up, bearing in mind that active groundwater containment techniques are generally less difficult to set up than passive containment techniques, that the operation and maintenance of the former may be expensive, and that these methods have a different impact on the environment.

Mechanical waste-water treatment methods, such as settling and filtration, do not help to remove most pollutants from aquifers. Depending on local conditions, on-site treatment methods should include the use of aeration, ozone, activated carbon or bacteria, or a combination of these.

As they seem promising, *in situ* clean-up technologies should be further investigated and developed.

Liability

Groundwater and soil pollution should be prohibited in order to safeguard groundwater for the future. Legal action should be taken against those known to, or believed to, have violated soil or groundwater pollution regulations.

Strict liability for remedial action and compensation for damage should be introduced at the earliest possible stage.

Where appropriate, property owners or occupiers should bear secondary liability for remedial action and compensation for damage.

The authority of municipalities should be strengthened so that they can enforce restoration. This may require additional financial support.

The polluter-pays principle should also be applied to past pollution, according to regulations in force when the pollution occurred.

To speed up remedial action of highly prioritized old contaminated sites, the polluter-pays principle should, however, be applied in a flexible way, particularly in the following cases:

(a) The polluter has proved that action has been taken in good faith and in accordance with previous legislation; and/or

(b) The present property owner or occupier has proved that the property has been received in good faith without knowledge of the existence of polluting substances.

The party responsible for corrective action should be forced to act and compensate for damage. If the responsible party is unable to do so, secondary compensation in the form of a fund, an insurance or other financial instruments should be provided to cover the costs.

National and multinational military forces should be placed on the same footing as any other polluter.