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THE POLICY OF THE COMMISSION OF THE EUROPEAN COMMUNITIES FOR THE PROTECTION OF GROUNDWATER

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ABSTRACT

The improvement in the standard of living and the growing demand by the agricultural and industrial sectors in Europe call for the mobilisation of all potential water resources. Underground water is a basic resource and it is necessary to protect it by restricting or prohibiting activities which might interfere with its use.

Since the adoption of the first environment action programme in 1973 the Commission has been continually concerned with the problems of protecting the quality and quantity of groundwaters.

Following a series of systematic studies a first step was taken with the adoption by the Member States in December 1979 of a Directive concerning the protection of groundwaters against pollution caused by the discharge of certain dangerous substances.

The content and mechanisms of this Community legislation are examined.

INTRODUCTION

The importance of groundwater to water supply throughout western Europe is now generally acknowledged. Even in those countries well endowed with surface water the exploitation of aquifers is increasingly important in view of the excellent quality of water from them and their very useful regulating role in a period of drought or shortage.

Much use is made of this resource in the Member States, and increasingly by those with a seasonal or local shortage of surface water (in 1977, Italy drew 12 162 million m^3/yr, France 5 731 million m^3/yr and the Federal Republic of Germany 3 615 million m^3/yr).

In some Member States, moreover, almost all of it is used for the public supply of potable water; in Denmark it is as much as 98%, in Italy 93%, in the Federal Republic of Germany and Belgium 71%, and in Luxembourg 70%.

Even in Ireland, which has an abundant supply of high-quality surface water, this figure exceeds 60% in some regions, although, overall, groundwater satisfies only 23% of the water requirement.

Groundwater is therefore a valuable capital resource which deserves to be protected by users and the authorities from any risk of pollution.

Measures for avoiding such pollution were strongly emphasized by the adoption of the Council Resolution of 17 May 1977 on implementing a Community policy and action programme on the environment. The Resolution provides, inter alia, that the Commission shall take the necessary measures "to protect the quality of groundwater and its abstraction points against pollution and against any ecologically unacceptable deterioration in the groundwater system".

ACHIEVEMENTS

Specific Directive: general comments

The Community reached an important stage in preventing groundwater pollution when the Member States adopted the Directive of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances.

An earlier Directive - adopted by the Council on 4 May 1976 - concerned pollution caused by certain dangerous substances discharged into the aquatic environment: this was really a framework Directive covering inland surface waters, territorial waters and internal coastal waters as well as groundwater. Article 4 laid down, however, that the provisions of that Directive would no longer apply to groundwater upon the implementation of a separate Directive, and it is the content of the latter Directive as well as its implementing procedures which are analysed here.

Like the framework Directive, the groundwater Directive is based on two lists of dangerous substances: List I ("black") and List II ("grey"). List I comprises substances which by their toxicity, persistence and bioaccumulation present a serious hazard to man and his environment. It contains substances or families and groups of substances such as organohalogen, organophosphorous and organotin compounds, carcinogenic, mutagenic or teratogenic substances, mercury, cadmium, mineral oils, hydrocarbons and cyanides. There are some important differences compared with List I in the framework Directive, namely with regard to substances' general characteristics, mineral oils and hydrocarbons and cyanides.

General characteristics

List I in the Directive of 4 May 1976 contained substances selected mainly on the grounds of their toxicity, persistence and bioaccumulation, with the exception of those which are biologically harmless or are rapidly converted into substances which are biologically harmless. This definition requires specific implementing measures and leaves considerable room for judgment about inclusion in the list: the characteristics described can be assessed only in terms of substance concentration levels and environmental conditions. With the Directive on

groundwater, however, the list contains the individual substances which belong to the families and groups of substances included, with the exception only of those whose harmlessness can be demonstrated and whose absence from List I warrants their inclusion in List II.

Mineral oils and hydrocarbons

List I in the Directive of 4 May 1976 included only recognizably persistent forms of mineral oils and hydrocarbons. In the groundwater Directive, a wider approach has been adopted since, in an underground environment, all mineral oils and hydrocarbons are likely to persist for a very long time.

Cyanides

Cyanides are gradually broken down in surface waters, but are more persistent in groundwater: hence their inclusion in List I.

Other changes under consideration

Some other substances such as lead, arsenic and chrome now on List II are thought to represent a serious pollution hazard in groundwater. An investigation is in progress to establish what happens to these substances in an underground environment and once it is complete the Commission will decide whether they, too, should be included in List I.

Nitrates are also being studied for possible inclusion in List II. The Commission hopes it will be able to put specific proposals in this field to the Council by the end of this year.

The substances on List II do not have the toxicity,persistence and bioaccumulation characteristics of those on List I but do have a harmful effect, which may, however, be limited by certain features of the receiving medium.

The introduction of these substances into groundwater may be tolerated in certain circumstances which are clearly defined in the Directive. In addition to lead, arsenic and chrome there are other metals and metalloids: zinc, copper and boron, certain biocides, organosilicate compounds, phosphorus, fluorides, ammonia and nitrites.

Comments on the content of the Directive

The aim of the Directive is to safeguard exploitable groundwater resources, i.e. the water in the saturation zone (defined as that portion of the aquiferous rock where all the voids are filled with water). This excludes water in the aeration zone, which either recharges the saturation zone or enters the plant biosphere.

Exclusions

The Directive does not apply to discharges of domestic effluents from isolated dwellings not connected to a sewerage system and situated outside protected catchmen areas (for water for human consumption), discharges containing trace elements and discharges of material containing radioactive substances.

(i) In the first case, the risk of polluting groundwater is reasonably low since the discharges do not generally contain substances on either List I or List II; at the very most, such substances are present in negligible quantities only. Furthermore, the dwellings concerned are mostly provided with septic tanks or disused wells which are checked by the local health authorities. And if these waste waters were subject to the Directive, considerable problems would arise, since it is impossible to monitor these effluents in practice.

(ii) In the second case, the discharges contain quantities and concentrations of the substances in question sufficiently small to preclude any risk of damage to the quality of the receiving groundwater.

(iii) Radioactive wastes are excluded because they are already partly covered by another Council Directive laying down the basic standards for the health protection of the general public against the dangers of ionizing radiation. Other standards, specific to the discharge of radioactive material into groundwater, are currently being worked out.

Direct and indirect discharges

There are two ways of making discharges into groundwater:

(i) straight into the saturation zone (e.g. from draining wells) with direct discharge, the polluting capacity of the discharged substances is undiminished.

(ii) indirectly, through the aeration zone. In the process, the discharged substances are subject to physico-chemical and, in some cases, biological action which may either arrest them or reduce their polluting capacity. The sum of such action constitutes the purifying capacity of the soil and the subsoil.

The indirect discharges with which the Directive is particularly concerned are those caused by the disposal of the substances on Lists I and II or by their storage with a view to disposal. The main reason for limiting the scope in this way is that diffuse discharges, chiefly those arising from normal farming practice, are not included.

The Council and the Commission are aware that the use of fertilizers and pesticides in agriculture is the reason why many aquifers are polluted. But the complexity of this problem and the nature of the discharges arising from this

activity demand practical measures in specific proposals rather than in this Directive.

With a view to limiting, or even removing, this source of pollution, the Commission has for several years been studying how to make the best use of products employed in agriculture. Proposals on this subject are now being worked out.

Prohibiting and authorizing discharges

Only in the case of chemically or biochemically degradable substances is it accurate to speak of the purifying capacity of the soil or subsoil. With the substances on List I, which are so persistent, the purifying capacity of the soil is practically nil. Their introduction into groundwater, whether direct or through the soil, is therefore prohibited. With the substances on List II, whether or not there is pollution depends on the size of the dose.

The transfer and evolution of these substances between the surface of the ground and the surface of the aquifer must first of all be investigated, and their introduction may only be authorized if there is no risk of the water being polluted+.

Exceptions

The Directive provides for certain exceptions to the arrangements prohibiting discharge in specific cases:

(i) Discharges into groundwater unsuitable for any purpose in order to get rid of certain substances which are stored in reservoirs used for this purpose only. Strict safety standards must be observed, however, and it must be impossible for the substances to migrate from the storage reservoirs; this solution has the advantage of removing highly toxic products from the ecological cycle and is economically attractive.

(ii) Water pumped out of mines and quarries, water for geothermal purposes and water pumped out during certain civil engineering work; i.e. waters which have undergone no change in quality and are reinjected into the source aquifer.

Derogations

Separate arrangements are laid down for the management of artificial recharges of

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+ The Directive defines pollution as follows:
"the discharge by man directly or indirectly, of substances or energy into groundwater, the results of which are such as to endanger human health or water supplies, harm living resources and the aquatic ecosystem or interfere with other legitimate uses of water."

groundwater. Aquifer replenishment is a useful way of improving the water supply; the practice must also be authorized, subject to prior inspection, by the authorities in the Member States. The Commission has also carried out a study of the various techniques used and the precautions which need to be taken with regard to the quality of surface water injected into aquifers.

Table 1 sets out, in schematic form, all the prohibitions and authorization procedures.

Checks at the authorization stage

All authorizations require prior investigation of the hydrogeological conditions of the zone where the discharge is to be made. The purifying capacity of the soil and sub-soil, if any, the risks of polluting the groundwater or degrading its quality must be examined by the authority, which must put forward a study of possible alternatives for disposing of the substances. The authorization may not be issued until monitoring and surveillance of the receiving water are ensured. When these conditions are met the authorization which is to be granted shall state, inter alia, the general and special discharge conditions and the checks to which the operator shall be subject. The result of the checks may influence the discharge procedure and may entail various changes, or even the withdrawal of the authorization.

CONCLUSIONS

The Directive analysed in this paper will come into force at the end of 1981. It is of course only a part of a wider programme which the Commission intends to carry out in order to protect, and provide the best possible management for, groundwater. It represents an advance, however, on existing legislation in the Member States. Its scope is not limited to the zone in the immediate proximity to the abstraction point but includes any zone from which the aquifer is recharged. In addition, all constraints intended to ensure the quality of the water must be investigated beforehand. At present, the information available to geologists is often inadequate.

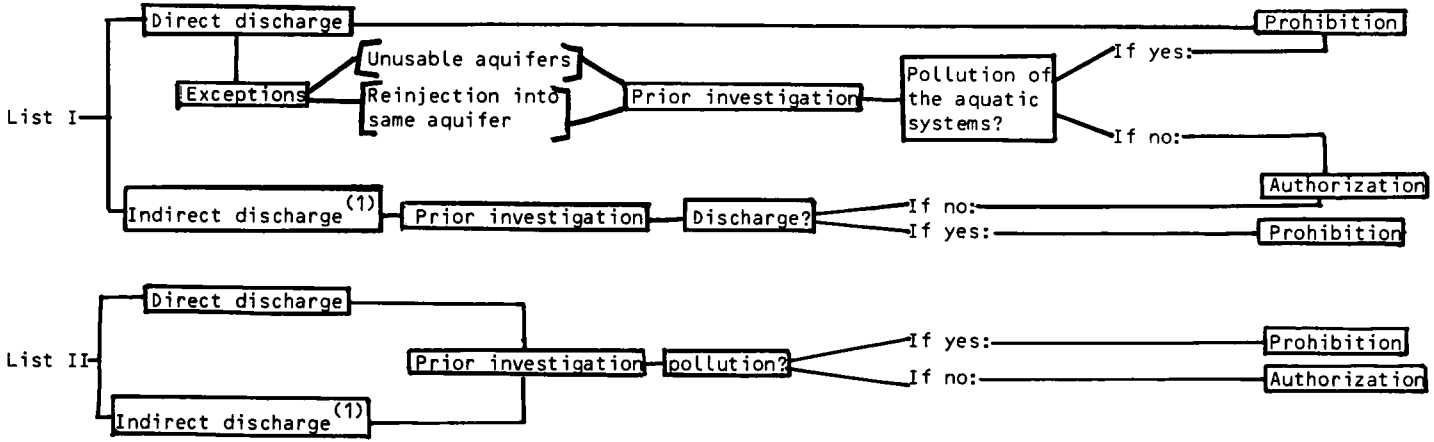
The requirement to carry out complete studies and institute means of control require considerable effort of the Member States. The Commission intends to lend a hand by supplying the local authorities with the information required to solve the problem.

Accordingly, the Commission has already carried out a study which assesses the quantitative balance of groundwater resources in the Community (inventory of aquifers, hydrogeology, exploitation of aquifers and estimates of additional resources). Another study is now in progress to define the qualitative balance:

TABLE 1

Exclusions: Domestic discharges from isolated dwellings;
Discharges containing trace elements;
discharges containing radioactive substances.

Derogation: Artificial recharging.



(1) Relates only to indirect discharges resulting from disposal or tipping for the purpose of disposal of substances in Lists I or II.

an inventory of current abstraction sites, the causes of pollution, forecasts and developments, the filtration qualities of the soil and its vulnerability. Research programmes have also been, or are being, carried out, which are mainly concerned with defining pollution levels, improving analytical techniques, and making epidemiological studies of organic micropollutants and monitoring inter-aquifer and surface-to-aquifer exchanges.

The results of all these activities will provide the national authorities with an essential instrument for implementing the Directive discussed in this paper and will enable the Community to monitor that implementation.