THE ENFORCEMENT OF DRINKING WATER QUALITY IN THE NETHERLANDS

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SUMMARY

Most people in the Netherlands take water for granted. Nevertheless this very water might quickly become one of the most important factors which inhibit the country's economic development, possibly causing a drop in the standard of living. A shortage of clean and safe (drinking) water causes illness, a loss of productivity, and poor public health - and it can lead to social and political turmoil. Conversely the demand for good drinking water will continue to increase as long as the population of the Netherlands also increases.

The authorities have developed a multitude of instruments with which they endeavour to guarantee the long term supplies of drinking water. This contribution discusses these in more detail.

1 THE NETHERLANDS

1.1 Geography

The Netherlands is a small country, with a surface area of some 41.000 km^2 and a population of about 15 million. It is located on the lower reaches of several big European rivers: the Rhine, the Maas and the Scheldt. These rivers all discharge their waters into the North Sea (illustration 1). Much of the Netherlands is below sea level and has to be protected from the sea by dunes and flood defenses, such as dikes. As so much of the Netherlands is below sea level the country has a highly ramified drainage system of channels, ditches, watercourses and discharge canals.

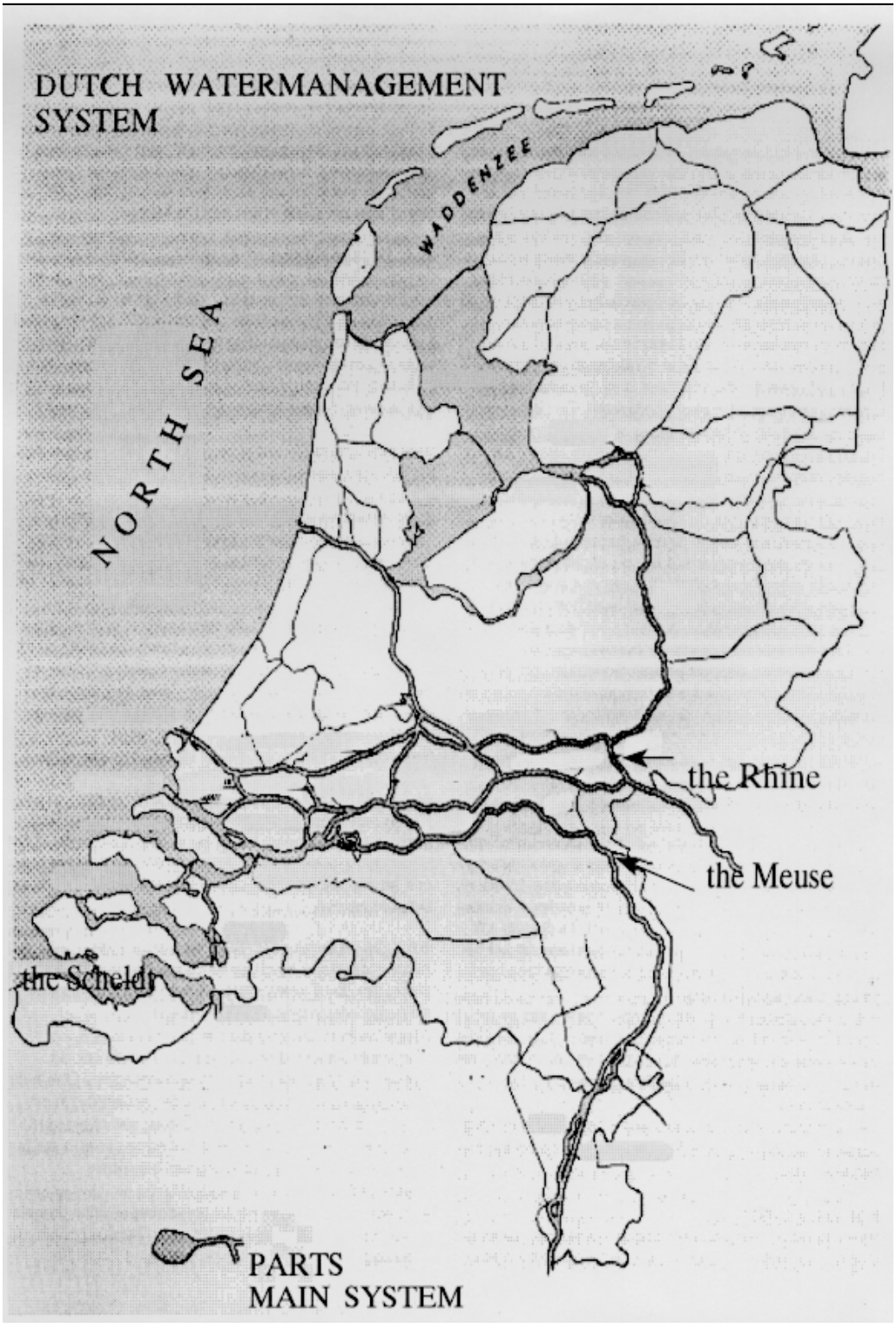
1.2 The authorities

The Netherlands has three layers of government, which are at central, provincial, and local level. Each layer has a governmental or administrative body bearing political responsibility, and a civil service which is responsible for the preparation and execution of policy. Parliament operates at the central level, whilst at provincial level there are 12 Provincial Executives, and at local level 630 Municipal Executives.

1.3 Drinking water supply

In 1996 thirty water companies provide the public drinking water supplies in the Netherlands. All companies supply drinking water for human consumption ('quality A' water), and some also supply 'quality B' water, which is solely for industrial and agricultural purposes.

The water companies are united in the VEWIN, the Dutch Water Suppliers' Association. They jointly produce about 1300 million m^3 drinking water each year. Of this about 1100 million m^3 is produced of groundwater and infiltrated surface water.


DUTCH WATERMANAGEMENT SYSTEM
WADDENZEE
NORTH SEA
the Rhine
the Meuse
the Schelde
PARTS MAIN SYSTEM

2 DIVISION OF RESPONSIBILITIES

2.1 Central Government

The civil service prepares legislation and policies and presents these to the authorities for approval (parliament). The policy plans contain the long term objectives.

The purpose of the policy as laid down in the Policy plan 'Drinking Water and Industrial Water Supplies' is to safeguard the future public water supplies for the benefit of the health, the welfare, and the prosperity of society in the Netherlands. The objective is to achieve an optimum guarantee of the continuity of the supply of good quality drinking water; the manner in which this is to be achieved also has to comply with the additional conditions that sustained development of society be feasible and that the costs be acceptable to the populace. The basic premise is that everyone in the Netherlands shall have access to sufficient drinking water which at least meets the requirements for the quality as specified in the pertinent legislation and regulations. Central government has the responsibility of supervising the execution of this responsibility.

The civil service is also responsible for the execution of some of the duties with regard to the surface water. These involve the monitoring of the quality and the discharge of the big rivers into the North Sea, the quality of the North Sea, and the granting of licenses for discharge of water into these waters.

2.2 The provinces

At the provincial level the civil service interprets the government's position to the specific situation in the province. This interpretation is then presented to the provincial authorities for approval. A number of duties are also carried out at provincial level. The provincial authorities supervise the quality and the drainage of the drainage system and they grant licenses for the discharge of water into these surface waters. They also grant licenses for the pumping of groundwater. In most provinces they are also responsible for the purification of the domestic and industrial waste water. In furtherance of this responsibility the provincial authorities grant the local authorities and industry permission to offer their waste water to the waste-water purification plant and to the surface waters which subsequently receive the purified water. However the provincial authorities do not have any specific duties with regard to drinking water; this is the specific duty of central government.

2.3 The local authorities

Within the municipal limits the local authorities can impose additional requirements over and above the policy as set down by the provincial authorities. This occurs only occasionally. In some instances the local authorities are responsible for the quality and the discharge of smaller (often inner urban) amounts of surface water. However their most important responsibility is the collection and transportation of domestic waste water to the waste-water purification plant. Another important task is to protect the soil (including the groundwater) of the groundwater catchment areas by spatial planning, environmental licenses and similar measures.

The local authorities can forbid the siting of industry in, or in the vicinity of, groundwater catchment areas. If industry is permitted in these areas then there may be extra conditions, such as the requirement that measures be taken to protect the soil.

2.4 The industrial sector

By law water companies are responsible for the public drinking water supplies. The management of the water company is obliged to ensure that the supply of sound drinking water to the users in the distribution area is guaranteed in such quantities and under such pressures as is required in the interests of public health. The companies carry out this obligation by drawing surface water from the big rivers and some regional waters, and by pumping up groundwater. This constitutes the raw water for the production of drinking water. After the water has been purified it is distributed to the users.

Table 1. Division of the pumping stations according to the type of raw water (1994)

TYPE OF RAW WATER	NUMBER OF PUMPING STATIONS
water table groundwater	131
water from the 2nd aquifer	87
bank-filtered river water	15
infiltrated surface water	9
surface water, direct or via reservoirs	7

3 PROBLEMS

3.1 Quality

The quality of water is detrimentally affected by the quality of water in the big rivers. The water in these rivers is polluted, either directly, for example by discharges upstream, disasters on the rivers, discharges from waste-water purification plants, illegal discharges, or indirectly by sources such as transboundary air pollution and shipping (including anti-fouling chemicals on hulls). As a consequence in the Netherlands the river beds and surface waters are heavily burdened with pollutants. The pollution also has an adverse effect on regional waters of all kinds. The regional surface waters are polluted in particular by diffuse sources such as water draining from the soil (such as polluted rainwater and polluted groundwater as a result of excessive use of fertilizers and protective agents used on crops). The groundwater is in particular polluted with nitrate and pesticides, again due to the use of excessive fertilizers and protective agents.

As the quality of the raw water is not ideal, maximum levels of various parameters have had to be specified; when these levels are not exceeded, then the surface water and groundwater may be used to prepare drinking water. The number of purification steps and techniques which are required to make drinking water of an acceptable quality from the raw water have increased in recent years.

Table 2. Development of purification techniques

Groundwater	Surface water (traditional)	Surface water (present day)
drawing from well	collection	collection
treatment with oxygen	prefiltration	prefiltration
filtration	coagulation	coagulation
clear-water reservoir	filtration	filtration
	chlorination	UV/ozone treatment
	clear-water reservoir	softening
		filtration
		clear-water reservoir

3.2 Quantity

The Netherlands is virtually completely dependent on other countries for the supply of fresh drinking water via the Rhine, Maas, and Scheldt. In the first instance it would seem that there is an abundance of water in the Netherlands; however this water is not always sufficiently pure to be suitable as raw water for the preparation of drinking water.

The amount of rainfall which is available to replenish the groundwater drawn from the soil is 680 m^3 per year per head of the population. This makes the country one of the driest in the world, with a rank equivalent to that of Kenya - whilst the demand for drinking water is still increasing each year, in spite of all the measures taken to conserve drinking water.

3.3 Guarantees

The water companies are faced with the difficult task of ensuring that they can supply sufficient good quality water at all times, whilst their influence on the quality of the raw water is limited. This makes it difficult for the companies to give guarantees to the supervisory authorities or to the users. They find themselves forced to build purification plants which increasingly resemble chemical plants.

4 SUPERVISION AND ENFORCEMENT

4.1 The supervision of the water companies

The water companies have to comply with their responsibilities as laid down in the Water Supply Act and the Water Supply Decree. The central government supervises compliance with these requirements for drinking water supplied to users, the operation of the purification system and the quality of the raw water. This is affected by means of an annual inspection of the

Parameter	number of measurements	number of times exceeded	percentage
degree of turbidity	15.233	13	0,1
acidity	16.466	10	0,1
total hardness	3.252	495	15,2
nitrite	5.879	5	0,1
nitrate	1.734	2	0,1
manganese	8.416	51	0,6
bacteria, coliforms	15.439	15	0,0
thermoduric bact. coligr.	2.220	4	0,2
pesticides	10.599	22	0,2

analytical data. The government used to carry out its own analyses, but has discontinued this practice. Consequently the supervision is now based on trust, complemented by inspection.

Values in excess of notification limits are reported at once by the water companies to the government and if possible and if necessary measures are immediately taken to rectify the situation. The specified limits are only occasionally exceeded “ex pumping station” or in the distribution network.

The raw water is frequently of insufficient quality for use in the preparation of drinking water. As a consequence the collection of water is halted, or the use of a well is discontinued for a longer or shorter period of time.

To date enforcement by means of administrative measures and the (temporary) closure of the water company have been used by the government only in very exceptional circumstances. The water companies are careful to protect their reputation, by avoiding the adverse publicity such situations would create.

4.2 Supervision of the raw water

Although the quality of the raw water (surface water and groundwater) is monitored by the water companies they can in fact only influence the quality to a limited extent. The quality of the groundwater is determined by the spatial and environmental policy of the provincial and local authorities. The provincial and local authorities designate areas within their jurisdiction as groundwater catchment areas. In such areas special regulations apply to the use of the soil,

Table 4. “Top Twelve” pesticides in raw water (1993)

	groundwater	groundwater	surfacewater	surfacewater
substance	pumping stations[1]	measure-ments	pumping stations[1]	measure-ments
drins	170	343	15	215
hexachlo-robenzene	170	333	15	254
lindane	166	315	13	202
atrazine	164	345	11	348
DDTs	153	302	15	207
heptane chloride	152	300	15	216
simazine	147	314	11	348
desmetryne	144	295	6	189
1,2 Dichloro-propane	136	447	3	95
ethoprofos	136	289	4	115
bentazone	24	271	6	88
DNOC	4	8	6	26

[1]number of pumping stations at which the substance was measured.

Table 5. Concentrations of *Cryptosporidium* and *Giardia* in surface water (1994)

	number of samples	% positive	arithmetic mean	range (n/l)	corrected average (n/l)
Crypto-sporidium					
Maas	39	90	0,040	0 - 0,36	1,4
Twenthe canal	13	100	0,42	0,13 - 1,59	1,6
Giardia					
Maas	39	85	0,046	0 - 0,58	1,5
Twenthe canal	13	100	0,67	0,24 - 1,29	2,9