Drinking Dutch Water

By Susanne Boom and Esther de Vreede[1], January 2002

Abstract

Covering The Netherlands with collective drinking water supply systems is the outcome of a long history. On the one hand this was driven by technical inventions like the hand pump and the process of industrialisation. On the other it was driven by recurrent outbreaks of water-related diseases in the rapidly expanding cities. Amsterdam was the first city to get tap water through house connections in 1854. In the beginning of the 20th century most urban centres were covered, while it took till the 1970's before safe, piped drinking water had also become available in the most remote areas of the Netherlands. Water supply companies produce drinking water out of both ground and surface water and distribute it through piped systems. The customers fully recover the costs of this, next to the capital and depreciation costs of the systems. The tariffs are controlled by the government which is the main shareholder of water supply companies that work as private companies under a Public Limited Company (PLC) structure. Full privatisation however, is not considered an option, as water is seen as a basic service, and profit making interests might come to override the quality and sustainability of our water resources. Already we are facing problems like over-extraction of the ground water and pollution of surface water. This calls for an active integrated approach on our water management. This will be mainly the responsibility of (local) government and water boards. The water supply companies on their turn contribute directly to environmental and natural resource management by using green energy, reallocating extraction points and actively co-operating in the management of flora and fauna. However, whereas several solutions are available, this is still not enough for the future and new solutions are still to be sought.

Introduction

How do people in the Netherlands get their water to drink, cook, wash, clean and produce? Is Dutch drinking water easy accessible and affordable? What about the water sources, the management, the policies and legislation, the cost recovery and the technologies used? This article is intended for foreign guests, who work in the drinking water sector of their country, visiting the IRC International Water and Sanitation Centre to get insight in the implementation process of the drinking water supply and the current drinking water sector in the Netherlands. It gives a brief historical overview of the evolution of the Dutch water supply sector, a description of the present situation and a quick look into the future. A lot has changed since Charles the Fifth visited Amsterdam in 1540 and left instantly as he refused to drink the Amsterdam water because it was too dirty and had a very bad taste…

Going back in time

Which water sources were used?

All over the world people settle down along water streams, the same happened in The Netherlands where cities developed along the banks of rivers. People used the water from these rivers as their main source to drink, to cook, to wash, to clean and to produce. At the beginning of the 14th century they started making canals out of the existing streams and ditches. This surface

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water got more and more polluted in upcoming and expanding cities, as people started using the canals to discharge their waste as well. Besides using surface water, rainwater was also harvested. Rich people stored this water in their cellars, others just used a barrel. In Amsterdam barrels were even put in place throughout the city to prevent people from drinking water out of the polluted canals. Groundwater is the third water source people used, taking it from wells by using ropes and buckets. These wells were hand-dug holes or driven tube wells, usually without a lining and without any above ground protection. Later they were improved and lifting structures were implemented to make this form of water collection more easily. (Waterleiding Museum, 2001).

How was drinking water managed?

Although the Romans implemented a perfectly working drinking water system in The Netherlands when they ruled in the 4th century, this system broke down after they left. Apparently, we could not manage these systems. In cities, district wells supplied the citizens with water. These wells were made of excavated tree-trunks, natural stone or barrels. The wells were maintained by the well caretaker. Often part of the well structure remained above ground in order to prevent the well from collapsing and people and animals from falling in to it. Fetching water was a women's task, although men also spent a lot of time at city wells doing business. The wells played an important role as social meeting places.

The invention of the (hand) pump was an important milestone in the development of drinking water supply systems. Water could be collected more easily and the water sources be better protected from pollution. In the 17th century open wells were replaced by pumps in the cities. This also happened in villages although people kept on using their original wells for a long time. However, although a distinct improvement, city pumps were not always safe; sometimes the water got polluted through nearby toilets. In the second half of the 18th century, selling of water became a special profession and clean (hot) water was sold from door to door in the cities. (Waterleiding Museum, 2001).

When and how did the Dutch people get tap water?

As cities kept growing, experts tried to come up with new solutions for safe drinking water. In the 19th century they developed a plan for using 'dune water', resulting in 1851 in a water supply company that transported ground water from the coastal sand dunes through large pipes to Amsterdam. In the beginning iron and leaden pipes were used for the waterworks, later pipes were made from steel, cement and asbestos (Waterleiding Museum, 2001). In 1854 the first drinking water supply system in The Netherlands was implemented in Amsterdam and house connections were installed. The second system was implemented in Den Helder (1856). It took a long time before other cities got connected to a drinking water supply system (Rotterdam and The Hague followed both in 1874) and the country side of The Netherlands was even covered much later.

Many people were not so enthusiastic about tap water because it tasted different to the water from traditional sources, such as open wells and drainage ditches. Campaigns to encourage piped water use were organised by the existing private water supply companies, including village visits by the water supply company director, who was guaranteed to get together the entire village community.

Eventually, consumers began to see the benefits of piped supply to the home and paid the required revenues.(Blokland et al., 1999).

Although the development of drinking water supply was left to local initiatives, it was triggered by 19th century trends of industrialisation and urbanisation. Recurrent outbreaks of cholera epidemics, together with the discovery that this disease was water-related, acted as catalysts in this process. It was observed that in cities where a drinking supply system was present, the number of victims was much lower. The 1867 'Report to the King' describes the generally poor condition of water supply throughout the country and emphasises the need for a national initiative. However, national government only got involved in the business of public water supply around 1910, when funds were made available to expand the coverage of the urban centres served before 1900. Between 1925 and 1950 a shift was made to the rural areas by the emergence of regional water supply companies. Until the 1950's some women still did their washing in rivers or at pumps. However, between 1950 and 1970, even the most remote areas of the Netherlands were reached and coverage became nearly 100%. Figure 1 shows the development of the water supply coverage in the Netherlands from 1899 till 1949. (Blokland et al., 1999).

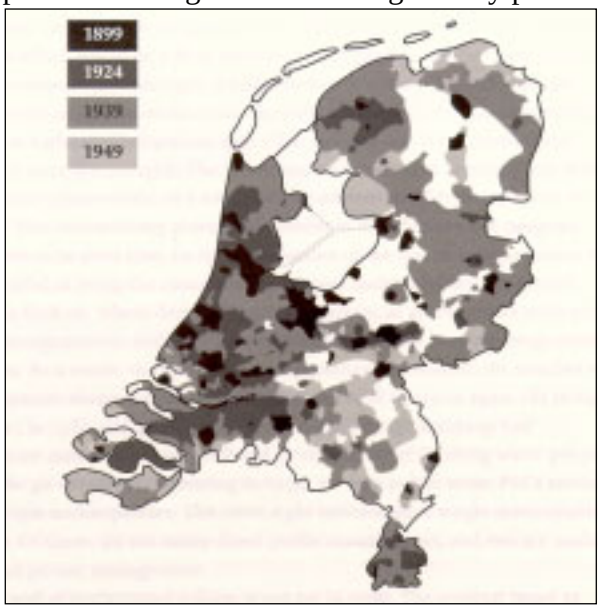

Figure 1: Development of Water Supply coverage in the Netherlands

What happens today

Where do we get our water from today? How do we get it clean and to our homes?

In 2000 the Dutch water supply companies produced and distributed about 1200 million m^3 drinking water plus another 72 million m^3 partly filtered water for industrial use. Besides water of drinking water quality, industries also use other (untreated) water sources (groundwater, surface water). In the Netherlands, drinking water is usually extracted from ground water (63%) or surface water (18%), but also from dune water (2%) and infiltration water (17%; being surface and rain water that is filtrated in sand dunes) (CBS, 1999).

The pipe network used for the distribution of Dutch drinking water totals around 100,000 kilometres. If you spread out the pipes of the Dutch drinking water supply system, it would go around the world five times! (Waterweetjes, 2001). In the distribution process the main area of concern for the water supply companies is that of too high lead concentrations in the drinking water, caused by (old) lead waterworks. The water supply companies are working hard to replace these kinds of pipes and bring the concentration of lead to acceptable levels all over the Netherlands. The responsibility for the government is to inform the public about the effects of lead in drinking water (i.e. heavy metal accumulation in the human body). (RIVM, 2001).

The treatment of groundwater is relatively easy, because by nature Dutch ground water has a good and constant quality. The most common technologies used are aeration, cascading systems and sand, carbon or gravel filtration. The treated water is then stored in sub-surface reservoirs, ready for distribution to the consumers. Water towers serve as supplementary water storage space, expansion vessels and provide pressure for the system in a flat country like this. They also play a role in signalling the water demands at pumping stations. Surface water is treated either through dune filtration or sedimentation. This takes about 6 months after which the water is transported to the water supply company for final (chemical) treatment.

A recent benchmark study of water supply companies (*A view of Water 2000*) shows that the quality of the drinking water in the Netherlands is a lot higher then (international) norms and regulations prescribe. (Accenture, 2001).

How is the Dutch drinking water supply sector organised?

The current set-up of the Dutch drinking water supply sector is a complex division of responsibilities over no less than seven actors: the European Union, central government, provincial government, municipal government, water boards[2], the Netherlands Association of water supply companies (VEWIN), and the individual water supply companies.

The European Union provides a framework within which the national government of the Netherlands formulates their own policy. The European policy concerns quality requirements for drinking water, quality and monitoring requirements for surface water intended for abstraction for drinking water and harmonising regulations on protecting groundwater and the prevention of water pollution. The national government is responsible for formulating 30-year Plans that contain general policy statements on the future of drinking water and quite a detailed overview of the future infrastructure needed to ensure the supply of drinking water for decades to come. Provinces are directly responsible for groundwater quality and quantity management, and at this level the national government policy is translated to provincial measures and plans. Permissions for groundwater withdrawal and infiltration are handed out and action plans for groundwater protection are drawn up. Water boards are responsible for the management of surface water.

The Dutch strategic water policy is formulated in national framework acts and policy documents. Currently, four nationally applicable Acts apply to water resources. In consultation with water supply companies and with advice of the World Health Organisation (WHO) and the Dutch Health Council the Ministry of Housing, Spatial Planning and the Environment (VROM) laid down norms for drinking water in the *Drinking Water Resolution* which is part of the *Drinking Water Supply Act* (last reviewed in 1984, new review in 2002). The main reason for initially introducing this Act in 1957 was to protect the consumers' health. Its main focus now is to ensure that the water supply industry will supply decent drinking water at present and in the future. Furthermore, this Act regulates supervision of the water supply companies, the organisation of

[2] A water board is a regional level elected government institution overseen by the democratically chosen provincial authorities. Nowadays each water board is responsible for the essential aspects of water management in a given area defined by a catchment's area and not by historical or cultural border. A further characteristic is that in the Netherlands water boards stay out of the production or distribution of drinking water. See article '*Managing Dutch Water*' by Corine Otte and Stef Smits (IRC, 2002)

the public water supply and the planning of public works. The *Groundwater Act* deals with the extraction of groundwater. This Act requires the provinces of the Netherlands to draw up provincial groundwater management plans. Recently these plans incorporated new policy stipulating that water supply companies have to pay tax according to the amount of extracted groundwater. As a result, the price of drinking water extracted from groundwater has increased. Additionally, the artificial recharge of aquifers is regulated in this Act. The *Water Authorities Act* entrusts the management of large rivers and lakes to the central government and gives authorities at the provincial level authority to management of smaller surface waters. The *Surface Water Pollution Act* provides a framework and several instruments to limit the pollution of rivers, canals, ditches and lakes by the discharge of wastewater. This responsibility is a formal task of the provinces and a practical task of water boards[3]. (Blokland et al., 1999; VEWIN, 2001).

Characteristic of the Dutch drinking water sector is the fact that water supply companies do not treat wastewater, which is the responsibility of the water boards. The tasks of municipalities are limited to sewerage collection and the construction and maintenance of the sewerage system covering 97% of the total population. Water supply companies are exclusively concerned with the production and the distribution of drinking water. They are legally responsible for the water quality from the point of extraction and treatment of ground water or surface water up to the point of delivery at the tap. Figure 2 makes the division in responsibilities in production to consumption and treatment of drinking water visible.

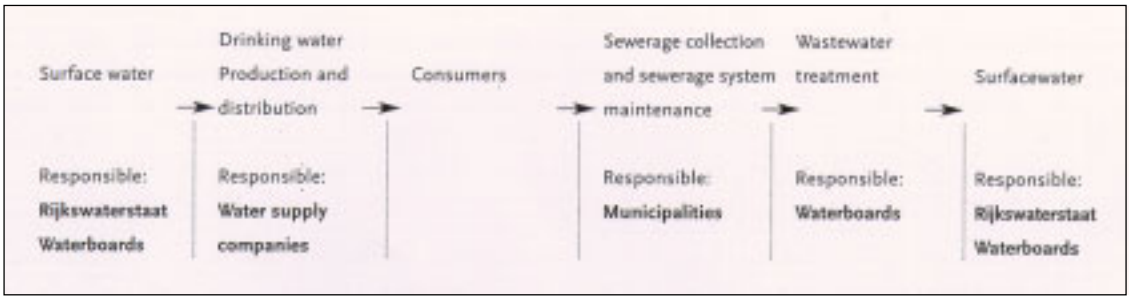

Figure 2: Responsibilities in the water cycle

Currently 24 water supply companies exist, spread out over six regions (VEWIN, 2002). A typical water supply company covers 200,000 – 600,000 connections, has 1.25 employees per 1,000 connections, 60% domestic demand versus 15% industrial demand and 25% other demand, and has 1 - 40 local authorities as shareholders. Water supply companies are - what we call - nameless government partnerships, i.e. Public Water PLCs (Public Limited Company). This means they are organised in such a way that the utility is incorporated as a PLC (or joint stock company) under Company Law, but where all the stock is owned by local, provincial or national government and who thereby retain a crucial element of control. The companies think that this governmental interference with a vital basic service like water supply is justified and even necessary. Because drinking water is such a vital product, the number of stakeholders in the process of producing and distributing drinking water tends to be large in comparison with

[3] For more information on the last two Acts and integrated water resource management in The Netherlands, see the article '*Managing Dutch Water*' by Corine Otte and Stef Smits (IRC, 2002)

companies that produce less vital products. These stakeholders all influence the functioning of the public water PLCs in one way or the other. (Blokland et al., 1999)

VEWIN is the Netherlands Association of water supply companies. They develops 10-year Plans based on the 30-year Plans developed by the national government. They also co-ordinate the individual plans drafted by water supply companies and also outline the required water supply infrastructure of the individual utilities which need to be implemented in the next ten years. Furthermore, VEWIN produces publications about different aspects of the drinking water sector, consults with government organisations and environmental organisations, lobbies on government policies and organises seminars and symposia. From the start VEWIN had a pro-active role in hygiene promotion, water supply construction, wastewater treatment and water saving campaigns. (Blokland et al., 1999).

Are the customers involved?

The PLC structure of water supply companies in The Netherlands ensures indirect consumer involvement through democratically elected municipal and provincial bodies. Direct customer relations constitute an important source of information for the companies. The public has free access to the annual accounts of the public water supply companies. In the past, customers rarely complained about water services. However, consumer awareness is on the increase nowadays and people do not hesitate to voice their criticism if they are dissatisfied with the quality of services rendered. Consumers have become more quality-conscious, and the water supply companies are acting accordingly. One example is the problem of “hard water”. Water-dependent electrical equipment like coffee and washing machines are sensitive to stains and scales on metal parts. In response to consumer complaints, nearly all companies have embarked upon expensive softening programmes.

Who pays? And what do we pay for?

In the Netherlands the drinking water sector is a non-profit sector, the water supply companies distribute their water at cost price. Full cost recovery has always played its role in the Dutch drinking water sector, even at the time when The Netherlands were less developed and customers had a limited ability to pay for piped water. Like many of today’s water vendors in other countries, private firms pioneered the supply of Dutch piped drinking water in the 19th century, and this tradition continues to underpin the reliability of efficient services these days. This economic approach to water supply is diametrically opposed to the “water as a special good” approach prevalent in many other countries nowadays.

The Dutch water sector relies upon individual consumer metering (96% of all connections (VEWIN, 2002)). Whereas it is clear that the individual metering of connections has its costs as well as benefits, the latter seem to outweigh the former. Individual metering produces a bill that is fair, provides hard evidence on water losses in distribution, and offers a valuable tool against manipulation of consumer water use. In the Netherlands, consumers are only likely to pay if they see the pricing system as transparent and fair. If not, they are allowed to voice their concerns and complaints by contacting the water supply company concerned.

People in The Netherlands (at household level) keep on using the drinking water supply system and don't have to depend on other water sources because the piped system is reliable (24 hours service a day), easy accessible (through house connections), breakdowns are repaired quickly (within the same day) and the water has a good quality (good taste, colour). Although tariff comparisons show that regional rates may differ by a factor 2, no public outcry has occurred. Apparently the rates are still low enough to satisfy consumers. In any case, it is available at only a fraction of the cost for bottled water and compared to other household costs per month, the water bill adds up to only 9% of the monthly costs (water € 15, electricity € 32, taxes € 36, telephone € 38 and gas € 50 (Accenture, 2001)), see Figure 3. The overall average use is 135 litres per capita per day of which half is warm water and three litres is used as water for drinking (VEWIN, 2001).

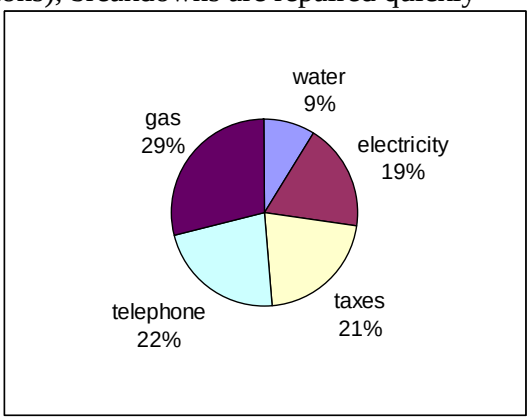

Figure 3: Division of average monthly household costs

In 2000 the benchmark study of the water supply companies pointed out that the average tariff is now € 1.28 per m^3, but also that there are rather big differences in tariffs between different regions and provinces. The lowest tariff is found with the water supply company in Groningen area at € 0.90 per m^3, the highest tariff people pay is € 1.78 per m^3 in Zuid-Holland Province. Underlying factors for this difference are (Accenture, 2001):

- the water source used by the water supply company;
- the number of employees opposed to the number of household connections;
- the average quantity used per household.

In general the water supply costs per household are composed as follows: capital costs 22%, operational costs 47%, tax 10% and depreciation 21%. The operational costs cover: costs for treatment by water boards and treatment companies; costs for construction and operation and maintenance by local authorities; and costs for the water supply companies for production and distribution. In some parts of the country sewerage taxes are related to the amount of (drinking) water used compared to the standard fixed taxes used in most parts of The Netherlands. (Blokland et al., 1999).

Besides the conventional drinking water supply system a few alternative systems are available. In some new housing developments separate sewerage lines are installed for grey and black water and rainwater is used for toilet flushing. Furthermore, new techniques are developed that are all simple, low cost, easy to operate and maintain and use a minimum amount of natural resources (water, fuel, wood). On small scale other inventions, like compost toilets (no use of water, composted human excreta can be used on land) and helophyte filters (successor of the sand filter that can be used as an alternative for sewage systems), are used.

Looking ahead

Can the environment keep up with the growing demand for water?

Because of rapid economic development and population growth in the Netherlands, the demand for water has increased explosively over the past 50 years. In fact it has increased by a factor four and will increase even more. Already this has resulted in severe over-extraction of water, which is in fact one of the main causes of degradation of the biodiversity in the Netherlands. The rehabilitation of the affected land calls for measures both within the areas affected and outside them. Surrounding areas may have a broad range of uses, from residential to agricultural. For this reason, many areas suffering from water over-extraction require an integrated approach. Amongst others this includes farmers who have to cut back their water use in dry times, but also big industrial companies who purify their own wastewater. The central government continues to encourage and support these plans, which already resulted in a 25% reduction in the area of countryside suffering from water over-extraction as compared with the 1985 figure. By 2010 a 40% reduction is envisaged (Eijsink et al., 2001). As water supply companies have become more and more dependent on surface water an integrated approach like this also includes integration of surface and groundwater resources. A logical step therefore is the transfer of groundwater management from provincial authorities to water boards, which will probably take place in the nearby future (Otte and Smits, 2002). Water supply companies themselves also contribute directly to environmental and natural resource management by using green energy, reallocating extraction points, and actively co-operating in the management of flora and fauna (Accenture, 2001).

Besides the above mentioned measures by government and water supply companies on the supply side, customers can also contribute in saving the environment by decreasing their daily water use (demand management). As such many water-saving techniques are being developed, like water-saving shower heads and washing machines, but also better use of the water is being promoted through commercials on television. On average the Dutch take daily showers for about 7.5 minutes; decreasing this to 6.5 minutes per day would save us 27 billion litres of drinking water each year! (VEWIN, 2001)

Will we have enough safe drinking water?

Since the late 1960s, the water supply companies have been involved in the development of an active, aggressive approach to fighting and preventing water pollution. Several Dutch water supply companies have to add extra steps to their purification process because of the high amount of pesticides in their water sources. The addition of extra purification steps obviously leads to higher costs. In fact, the cost of producing drinking water is becoming so high that recently plans have been announced to import water (for industrial use) from Norway. According to these plans, it is cheaper to transport rainwater and water from melted snow from Norway than to purify water from the large rivers in the Netherlands. The imported water is to be transported in enormous bags that can hold up to 80 million litres of water, to be tugged from Norway to the Netherlands by boat. The fact that this elaborate undertaking is cheaper than purifying the water from our own rivers is illustrates of the rising costs of purifying water from the large rivers. Nevertheless, people are also working hard to prevent our rivers from polluting that badly, and

also the extraction of snow and water from Norway will have its impact on the environment and as such can not go on forever. (Blokland et al., 1999).

Institutional changes ahead?

In the global water sector, we can see a trend towards the privatisation of water supply companies. While policy in this regard is still rather cautious in The Netherlands, privatisation has already been undertaken on a large scale in many other countries. The Dutch government is drafting a new Water Supply Act, which - in the light of control and effectiveness - might limit the current freedom of operation of the water supply companies. This could lead to a situation more similar to England, with the difference that here the water supply companies are fully privatised. The English Office of Water Services OFWAT is forcing the fully privatised water supply companies to lower the prices of drinking water, making them operate more efficiently. The benchmark of Dutch water supply companies is already one instrument whereby the name-and-shame principle might stimulate the companies to improve their quality and efficiency. (H2O, 2001).

As for full privatisation the government's position is clear; quoting the Minister himself: "Commercial interests do not suit a sector that provides such basic services as water supply" (H2O, 1999). The profit making interests might come to override the current attention given to quality of the service, sustainability and water resource management. As such water supply concessions will be given only to those companies that are government owned, profits will be restricted and the companies must separate water supply from other commercial activities, whereas some companies have merged with other utilities like electricity and communication.

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