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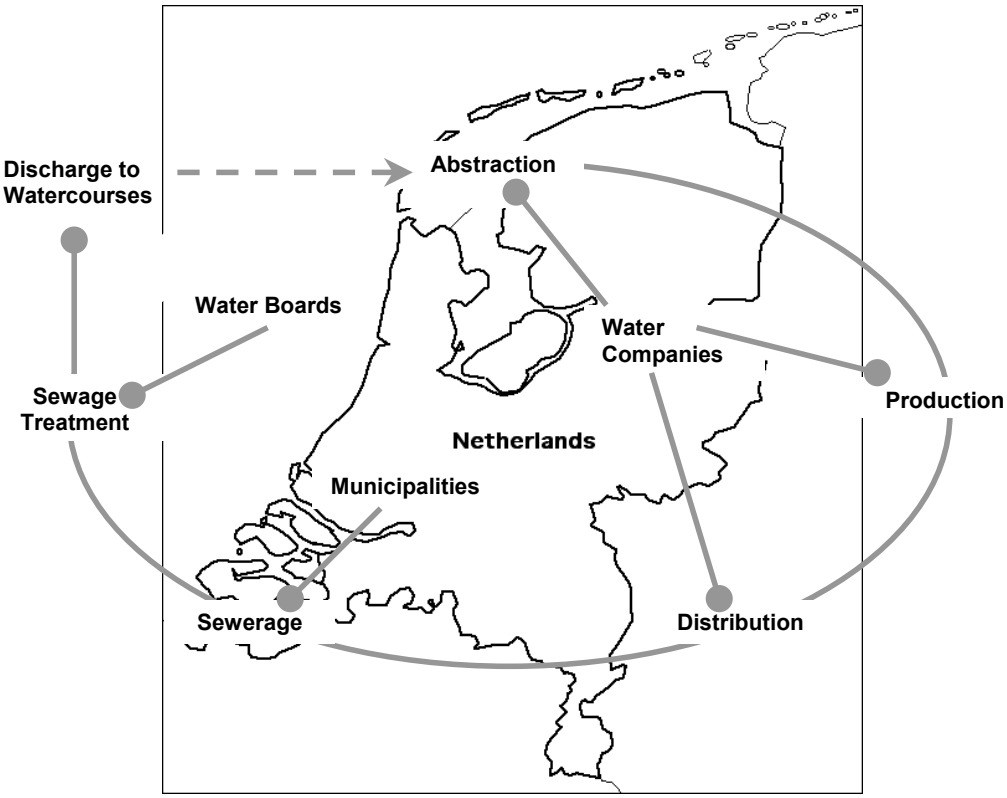

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Evolution of Legislations and Regulations in the Dutch Water Supply and Wastewater Sector

Master of Science Thesis

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The findings, interpretations and conclusions expressed in this study do neither necessarily reflect the views of the UNESCO-IHE Institute for Water Education, nor of the individual members of the MSc committee, nor of their respective employers.

To my wife and my daughter…

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ABSTRACT

The Dutch water supply and wastewater sector has come a long way from the Middle Ages when protection of man against water was more important. The trend has been reversed these days to protect water against man's activities. Parallel to these changes in the sector the legislations and regulations governing and regulating the water supply and wastewater sector also have been evolving. It is hypothesised in this research that the evolution of the water supply and the wastewater sector in the Netherlands, has been from a legislative to an economic regulatory approach. To establish whether this is true or not is the primary aim of this research. Additionally the research strives to answer the question as to why the evolution took place. The methodology adopted in this research is based on historical analysis to identify trends in the evolution of the legislations. It looks for evidence of application of prescriptive instruments representing the legislative approach and the incentive instruments representing an economic regulatory approach. Systematic analysis of the legislations has been performed whereby objectives and rationale of the legislations are stated, actors of implementation and target groups are identified and an inventory is made of the prescriptive and incentive based policy instruments. By conducting case studies gaps between the objectives of the legislations and the extent to which the sector realises these objectives has been estimated. This is done in order to understand the reasons for the evolution of the legislations.

Findings of the research indicate that the evolution of the legislations has not been as hypothesised. Except in the case of one of the acts (Pollution of Surface Waters Act) none of the other acts have evolved as hypothesised. Mixed results have been observed; Water Supply Act is based on a very legislative approach has achieved good results, whereas the Groundwater Act is based on a combined approach has achieved results that are not in line with its objective. The Pollution of Surface Waters Act has realised good results in tackling problems or point source, but is facing problem with diffuse sources of pollution.

The research does not in anyway advocate the use of either the legislative approach or the economic regulatory approach over the other. The research hopes to serve as a preamble to further research looking at issues related to impact of the legislations on the water supply and wastewater sector in the Netherlands.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

BOD	Biochemical Oxygen Demand
DBFO	Design Build Finance Operate
EC	European Council
EEC	European Environmental Council
EMA	Environmental Management Act
GAO	General Administrative Orders
GPEPA	General Provisions for Environment Protection Act
GW	Gemeentenwerken (Public Works Department)
GWA	Ground Water Act
NWF	Nuon Water Friesland
PSWA	Pollution of Surface Waters Act
UvW	Union of Water Boards
VEWIN	Association of Water Companies
VROM	Ministry of Housing, Spatial Planning and Environment
V&W	Ministry of Transport, Public Works and Water Management
WBE	Waterbedrijf Europoort (Water Company Europoort)
WMA	Water Management Act
WG	Waterbedrijf Gelderland (Water Company Gelderland)
WMO	Waterleiding Maatschappij Overijssel (Water Company Overijssel)
WSA	Water Supply Act
WSGA	Water Supply Companies (Groundwater) Act
ZHEW	Zuiveringsschap Hollandse Eilanden en Waarden

1 INTRODUCTION

This document has been prepared as a prerequisite for partially fulfilling the requirements for award of Masters in Science of Sanitary Engineering degree by the UNESCO-IHE Institute of Water Education at Delft, The Netherlands.

This research topic deals with the evolution of legislations and regulations in the water supply and wastewater sector in the Netherlands. The primary aim of this research is to establish whether the legislations relating to water supply and wastewater sector in the Netherlands are evolving from a legislative approach to a more economic regulatory approach. The study involves analysing the legislations over a period of time (since they were first implemented till now) to ascertain trends in their evolution from a legislative to an economic regulatory approach. While analysing the changes in the legislations a conscious effort has been made to trace the reasons that caused these changes. The legislations analysed are the Groundwater Act, the Water Management Act, the Water Supply Act, the Environmental Management Act and the Pollution of Surface Waters Act. Within themselves the Acts cover all portions of the water cycle from abstraction of water to treatment of wastewater and disposal.

In the middle ages the most important task in the Dutch water sector used to be: protection of man against water. This trend was then reversed and the increasingly threatened water resources needed to be protected against activities of man. In the past water supply and wastewater services were also arranged mostly on a very local level, where as now, there is a noticeable trend towards scaling up. Technological advances have also played their part in improving the environment and on many occasions adding to the pollution burden. Lately, influence of the EU directives is also beginning to be felt on the Dutch legislations.

These developments have not been without consequences for the way in which the water supply and wastewater sector is regulated. An important question to ask would be: what does this evolution of legislations mean for the sector: will it continue to ensure better services, will it mean more private sector involvement, liberalisation? Answering these questions is out of the scope of this research. The research serves as a preamble and helps to understand whether the legislations and the legal environment that they have created are conducive to developments such as private sector involvement or liberalisation.

The methodology adopted in this study is based on a historical analysis of the legislations mentioned earlier in order to spot trends in the application of specific policy instruments. The theory behind establishing the trends is that the legislative approach is characterised by the application of prescriptive instruments and the economic regulatory approach by the application of incentive based instruments. A detailed analysis of the legislations has been performed in order to understand the content of the legislations vis-à-vis objectives, rationale, actors of implementation, target groups and presence of policy instruments. Case studies have been conducted in order to understand how the legislations are implemented by the sector. Comparisons are then made between what the objective of the Acts and what the sector has achieved. The gaps, if any, help to understand the reasons for evolution of the legislations.

A brief description of the chapters to follow is as listed below:

- Chapter 2 the research framework. It explains the background based on which the hypothesis has been formulated and states the research questions. It also explains the scope of the research and the methodology used in analysing the various legislations.
- Chapter 3 gives a broad idea of the Dutch water supply and the wastewater sector, its various actors, their functions and inter-relationships.

- Chapters 4 through 8 analyse the Acts that regulate the Dutch Water Supply and Wastewater sector their individual evolution since the time they were first introduced, the current state they are in and the way they are implemented in reality. Each of these chapters concludes with observations on the research questions mentioned in the chapter 2.
- Chapter 9 summarises and discusses the observations made in the chapters 4 through 8 and discusses the implications of the same.
- Chapter 10 draws conclusions based on the analyses performed in the chapters 4 through 8 and chapter 9 and answers the research questions mentioned in chapter 2.

2 RESEARCH FRAMEWORK

The present chapter is about the background to the research, whereby the need to study this issue is justified. Based on this background study the hypothesis is stated and also the scope of research is defined. Legislative approach and the economic regulatory approach, the central themes in this research have also been explained here. Concepts of the variables/indicators that will help tell the different approaches apart have also been put forward. Finally the methodology used in the research is also explained. All in all the various items of this chapter form the basis on which, further work on this research has been conducted.

2.1 BACKGROUND

In this section the historical development of the water supply and the wastewater sector in the Netherlands will be studied in order to get a contextual understanding. Some interesting events like the privatisation debate and the developments at the EU level will also be discussed. These studies form the basis on which the hypothesis has been developed.

2.1.1 Historical development of the water supply and wastewater sector

The Netherlands is famous for the management of the water system since the 11th and 12th century. In the 13th century democratic district Water Boards were established to manage the water systems on a very decentralised level. When compared to the long history (since medieval times) of management of the water systems, the water supply and wastewater services can be considered recent developments. In the second half of the 19th century the first Dutch drinking Water Companies came into being in the larger Dutch cities. The collection and treatment of wastewater started even later. Table 1 below lists the relevant and important legislations in the field of water supply and wastewater management.

Table 1 Dutch water supply and wastewater legislations and policy plans

Year	Legislation/Policy plans
1935	Act of Goods
1954	Water Supply Companies (Groundwater) Act
1957	Water Supply Act (WSA)
1960	Water Supply Decree
1968	First National Water Policy Plan
1969	Pollution of Surface Waters Act (PSWA)
1981	Groundwater Act (GWA)
1984	Second National Water Policy Plan
1986	Soil Protection Act
1989	Water Management Act (WMA), First Environmental Policy Plan & Third National (Integral) Water Policy Plan
1993	Environmental Management Act (EMA)
1994	Second Environmental Policy Plan
1997	Third Environmental Policy Plan
1998	Fourth National (Integral) Water Policy Plan
2001	Fourth Environmental Policy Plan

In the evolution of the legislations for the Dutch drinking water and sanitation sector several phases can be defined:

Phase 1: from 1850 – 1900: introduction of the drinking water supply companies

Phase 2: from 1900 – 1950: widening of the networks
Phase 3: from 1950 – 1970: institutionalisation of the water supply sector
Phase 4: from 1969 – now: focus on environment and harmonisation of policies

2.1.2 Phase 1: Introduction drinking water supply companies (1850-1900)

The birth of the drinking water sector, Klostermann (2003) claims, happened in the year 1851, when King Willem III, gave permission to establish the first Dutch water company in Amsterdam. Remarkable is the fact that the Dutch financed only 4.3 % of the costs. The company was for more than 95% financed by English capital. The Municipality Law of 1851, declared public health was a task of Municipalities. In the wake of the severe Cholera epidemic in 1866 the Dutch government installed a state committee to look into the matter. The committee in its report to the King gave its ideas for legislation and quality control. The report and its suggestions were unfortunately disregarded by the national government. Rotterdam and The Hague installed their water supply networks about two decades later than Amsterdam. Instead of the private capital as was used in Amsterdam, The Hague and Rotterdam used public capital to finance the investment. In 1897, during the second Dutch Public Health Regulation drinking water requirements were formulated. By the end of the 19th century almost all Dutch major cities had a public drinking water distribution network.

2.1.3 Phase 2: Widening of the networks (1900-1950)

In 1901 the first Health Act was framed, whereby supervision of the drinking water quality was to be accomplished by the National Government. During the period of 1900-1935 water quality requirements were described in the Act of Goods. Regulation was also framed to compensate the negative effects of public water supply to private landowners. To stimulate a growth in the number of connections and harmonisation, national regulation was implemented in 1927. Every house, it was stated should have some sort of water supply or a connection to the drinking water supply system. A connection to the supply system was obligated if a new house was built near (maximum 40 meters) the existing network (Gunther, 1934).

Besides drafting regulations, the State also provided subsidies and loans for smaller Municipalities to finance drinking water treatment plants and supply systems. The subsidies resulted in an increase of drinking water connections in the first half of the 20th century. Klostermann (2003) quotes Leeflang (1974) that in 1940, 75% of the Dutch citizens had access to drinking water supply. Sewerage system development was taken up several decades later. However, already in 1940, 49% of the Municipalities did have a sewerage system.

2.1.4 Phase 3. Institutionalisation of the water supply sector (1950-1970)

The Provinces, Water Boards and Municipalities have historically had an autonomous jurisdiction. This autonomy has been framed more and more by a model of close cooperation with the central government since the Second World War. The central government has since then been taking the initiative of policy-making, the authorities cooperate by additional inputs to policy-making and implementing policies within the national policy framework (Kuks, 2003a). Before the Water Supply Act was implemented every Province had it's own regulation and concessions, without the National Government's interference. The Water Supply Companies (Groundwater) Act of 1954 created a concession system for water suppliers, which had been a start of a process towards the institutionalisation of the public water supply. The growing demand for drinking water required the Water Companies to search for new raw water sources. Because of the importance of the drinking water service landowners had to allow extractions even if the withdrawals would negatively affect their property (Kuks, 2003a). Legislation about the

institutional setting and the supervision of water supply companies were framed later. It was not until the year of 1957 that the institutional setting of water supply companies was regulated and the service levels were set in the Water Supply Act. In 1960 the Water Supply Decree was published which supplemented the Water Supply Act by specifying the technical, hygienic, medical and administrative implementation measures concerning the water supply. At that time the Water Supply Company of Amsterdam already existed more then a 100 years.

The harmonisation process of the water supply and the wastewater sector and the dominant presence of the relationship between water and health was set through in the year of 1968 when the first water management policy plan was made. This water management policy plan focused on the protection and the management of the quantitative water resources especially from the health perspective.

2.1.5 Phase 4. Focus on Environment and harmonisation of policies (1969 - now)

The first initiatives for wastewater treatment are from the 1920. But in the 1950s and 1960s wastewater became an important issue not only in the Netherlands but also in many other Western European countries. The international focus on the quality of surface water contributed to the introduction of the Pollution of Surface Waters Act (PSWA) in 1969. The introduction of this Act hints at the increase of importance of the effects to the environment in the decision-making processes. Even today the PSWA is the main legislation to control surface water quality, setting up a funding and a permit system. The funding system is designed for full cost recovery of the water board's water quantity charges (Kuks, 2003a). Section 23 of the PSWA specifies the use of the revenue from the levies; finance its own surface water pollution control measures, pay levies imposed on it by others and make payments towards costs incurred in order to take measures for prevention of pollution of surface waters. Before the introduction of the PSWA 8 million pollution equivalents had already treated. Since 1969 the treatment capacity rapidly increased towards 24 million pollution equivalents in the year of 1995 (Verhallen et al, 1998).

The Soil Protection Act was put forth in the 1986 in order to tackle the pollution from diffuse sources. The act contained two protection levels, general and specific. The general protection level is filled in at the national level via General Administrative Orders (GAOs). The GAOs cover diverse causes of pollution such as spreading of manure on soil, discharge of liquids into soil or groundwater, application of sewage sludge or organic waste or compost on soil, dumping of solid waste material and artificial recharge of aquifers. The specific protection level measures have been transferred to the Environmental Management Act as of 1999. For groundwater protection the act stipulates that the Provincial Council draw a provincial plan once in every four years. The plan needs to put forward a provincial environmental policy and also identify areas that may need special protection (van Put, 2001).

In contrast with the freedom of the Water Companies to access raw water sources in the 1950s, the Groundwater Act of 1981 provides protection rules for farmers who are affected negatively due to the ground water abstractions by describing access restrictions. Moreover Provinces are allowed to have groundwater extractions charged. The income of these provincial charges should be used for anti-desiccation measures. The development of a broader perspective towards water management is also recognisable in the Constitution Revision of 1983, which proclaimed that the public domain should be dedicated to the protection and sustainable improvement of the living environment, including the natural water system. The same year a right of competence for the Water Boards was established in the constitution revision, providing them a position in the Dutch administrative model, equal to that of the competencies of Provinces and Municipalities, but restricted to functional administration in the field of water management (Kuks, 2003a).

In the field of water policy, the Netherlands started a planning tradition in 1968 already, with a First National Water Policy Document, followed by a second one in 1984, a third one (the first integral water policy plan) in 1989, and a fourth one in 1998. The Dutch system of integrated water management, adopted in 1985, takes account of all the many functions fulfilled by water systems in the Netherlands. Also around 1985, the Dutch environment department has adopted 'consensual steering' as one of its main policy strategies, which means that policy target groups were consulted and committed to environmental policy goals and to policy implementation by means of policy agreements. An integral vision on water management, based on the regional water system approach taking into account ecological aspects was put forth in the same year. These various legislations were moves towards the organisation of water policy planning in order to complete the system of legislations allowing an ecological protection of water systems (Kuks, 2003a). These plans also point out the broader view in the water management policy process.

The most characteristic development towards more integrated water management was the enactment of the Environmental Management Act in 1993. The Act forms an integrated environment act, which replaces many former regulations. Only the PSWA has not been integrated. According to the EMA once in every four years environmental plans on national and provincial scale have to be produced. These plans are the guidelines for the future water policy.

Different objectives related to the water sector are described in the Fourth Environmental Policy Plan: 'A World and a Desire, working on sustainability'. One of them is to stabilise the drinking water consumption until 2005. Central principles are the "Precautionary" and the "Polluter Pays". The general objective of the Fourth Environmental Policy Plan is to have and maintain a safe and habitable country and to maintain and increase healthy and flexible water systems so sustainable usage will be guaranteed in the future. To achieve this goal the plan pleads for an integrated approach towards spatial planning, water and environment focused on different interest such as agriculture, transport, recreation and fishery. The Table 2 below broadly portrays the various phases in the development of policies in the Dutch water supply and wastewater sector.

Table 2 Phases in the development of water policies in the Netherlands

Phases	Policy Design
1. 1850 – 1900 Introduction of drinking Water Companies	Objectives: introduce drinking water treatment and distribution Rationale: Clean drinking water will decrease the number of infected people Instruments: foreign, private and public capital to develop and exploit public water distribution
2. 1900-1950 Widening of distribution networks	Objectives: organise a good water supply and improve public health for as many people as possible Rationale: Clean drinking water will decrease the number of infected people Instruments: State subsidies and loans to expand the drinking water distribution services to the rural area, introduction of legislation about the quality of the drinking water supplies, national regulations for boosting the connection rate
3. 1950-1969 Institutionalisation of the water supply sector	Objectives: to supply sufficient water of a good quality for a growing population with an increasing living standard Rationale: harmonisation of legislations and increase coherence among the legislations Instruments: Legal framework and subsidies to expand the drinking water network, concession system for water suppliers, institutional set up and service levels specified in legislations

Phases	Policy Design
4. 1969 - now Integration and harmonisation	Objectives: Ecological protection and sustainable usage of water systems Rationale: Healthy and flexible water systems will help to ensure sustainable usage in the future Instruments: Pollution levies, Administrative orders, policy plans, environmental policy plans, charges on groundwater extractions, Target group: polluters, groundwater extractors, farmers

Of particular importance to this research is the way in which the policy objectives during the different phases were realised. In the latter half of the 19th century when the Water Companies were being introduced, the main instruments were the foreign, private and public capital. During the next phase, subsidies and loans were the primary instruments, which helped expand the network. During this phase the first legislations were also introduced. Later on in the third phase the legislations were targeted towards protection of public health by specifying service levels and other requirements in the legislations. Later on the target has been ecological protection and sustainable use of water systems by applying pollution levies, charges on extraction of groundwater, policy plans and programmes and administrative orders.

2.1.6 Other developments

In the year 1997 the Ministry of Economic Affairs in the Netherlands published a study that stated that efficiency savings could help reduce the price of water by at least 10% (Dijkgraaf et al, 1997 as quoted in Kuks, 2003b). In 1998 the V&W also took the position that it should in principle be possible for Water Boards to operate in a free market for industrial effluents whereas for the domestic effluents retain the sole responsibility. In 1998 the VROM also voiced similar intentions whereby water supply to households would be still the responsibility of the Water Companies, but large consumers would be allowed to choose their suppliers. This debate was founded on the developments at the European level like the liberalisation of the utility sector and the competition regulations (Kuks, 2003b).

The EC's competition policy aims to prepare and develop a state of effective competition in the common market by impacting on the structure of markets and conduct of market players. This competition policy is applicable to all service industries and hence to water also. The policy has been applied to other network industries like energy, transport, and telecommunications. It is claimed that the improved competitiveness has resulted in efficiency gains, benefits to the customers (lower prices and variety of choice), technological innovation research and investment (Walker and Marr, 2002).

The implicit link between the happenings at the EU level and the policies related to water supply and wastewater in the Netherlands is based on the following issues:

1. Massive funding required in the wastewater sector to realise improvements to the environment
2. Greater transparency in the financial management of services
3. Increase in customer expectations

2.2 HYPOTHESIS

Since the 1950s there has been a steady stream of policies targeted towards the water supply and wastewater sector in the Netherlands. The earlier policies for example the Water Supply Act, it can be noticed, were based on a more "assertive" or a "command" style of policy. There were

detailed specifications for technical, hygienic, medical and administrative measures. As against this the Pollution of Surface Waters Act, which was put forth in 1969 has a dual approach. The PSWA required the dischargers of wastewater to have a permit for doing so and at the same time also required them to pay for the pollution that they were causing. Since the charges were based on the actual quantity of pollutants discharged, there was incentive for the polluters to pollute less and thus benefit by paying lesser charges.

The transition in policy style can be noticed very easily between the two acts. The Water Supply act stipulated constant supervision and control where as the Pollution of Surface Waters Act gave incentives to the operators themselves to perform better or fined then when they did not perform as per the requirements. This difference in policy style is the kick-off point for this research. In line with this the following hypothesis has been developed.

"The water supply and wastewater sector in the Netherlands is evolving from a legislative approach to a more economic regulatory approach".

2.3 SCOPE OF THE RESEARCH

The following pieces of legislations, which are directly relevant to the water supply and wastewater sector in the Netherlands will be analysed:

1. Groundwater Act
2. Water Management Act
3. Water Supply Act
4. Environment Management Act
5. Pollution of Surface Waters Act

The above-mentioned legislations cover all the aspects related to the water cycle namely water abstraction, treatment and distribution and sewerage and wastewater treatment. Each of the legislations will be analysed from the time of their implementation for the first time till their current state.

2.4 RESEARCH QUESTIONS

There are four basic possibilities with the way the legislations might have evolved (or not evolved). These are listed below.

1. Predominantly Legislative approach to a more economic regulatory approach
2. Predominantly Economic regulatory approach to a more legislative approach
3. Predominantly Legislative approach all through out
4. Predominantly Economic regulatory approach all through out

For the sake of this research it is important to focus on the first question in the list above. In order to test the hypothesis it is important to answer the question:

1. Is there an evolution in the water supply and wastewater sector from a legislative approach to a more economic regulatory approach in the Netherlands?

An associated question to the one above is:

2. In case an evolution, from a predominantly legislative to a more economic regulatory approach, is indeed observed did the evolution in the legislations happen?

Answering the above-mentioned questions is the primary aim of this research.

2.5 METHODOLOGY

A clear-cut idea of what constitutes the legislative and the economic regulatory approach is necessary in the first place before venturing any further into the methodology for this research. Various literary materials were reviewed in order to find suitable definitions for the legislative and economic regulatory approaches. The following have been reproduced with the intent of use in this research.

From the discussion below it will also be clear that that prescriptive instruments represent a more legislative approach and incentive based instruments represent a more economic regulatory approach.

2.5.1 Legislative approach

The legislative approach has been often referred to as the "command and control" approach. By enacting the command and control approach the policy makers hope to mandate people by enacting a law, to bring about a behaviour or change in behaviour, and use an enforcement machinery to get people to obey the law. The legislative approach or the CAC approach consists of a 'Command', which sets a standard, for example minimum quality standards for drinking water, and a 'Control', which monitors and enforces the set standard (ESCAP, 2001).

The chosen variable/indicator that will be used to identify a legislative approach is the application of prescriptive instruments. Prescriptive/regulatory or command and control instruments as they have often been referred to, are required to achieve a set target. These instruments are particularly suitable in cases where the risk of non-compliance escalates very quickly. In order to be effective the prescriptive instruments need to have a penalty for non-compliance, which in turn asks for monitoring measures to detect non-compliance (OXERA, 2003).

2.5.2 Economic regulatory approach

The economic regulatory approach has been often referred to as the "carrot and stick" approach. Carrot refers to the incentives (positive) that one is awarded when abiding by the rules, whereas the stick (negative incentives) is awarded in cases of violation. The overall objectives of economic regulation include the protection of public interest through the promotion of effective, financially viable and sustainable water services, ensuring adequate (but not excessive) investments in infrastructure, appropriate pricing, and promoting the efficient use of water (WRC, 2002).

Like in the case of legislative approach the economic regulatory approach too has its own identifying variables; incentive based instruments, effluent trading permits and deposit refund schemes. For the sake of this research only incentive instruments will be tracked. The concept of incentive based instruments is explained below.

Incentive instruments are those, which tend to induce certain behaviour or change in behaviour by way of financial incentives. The incentives may be either positive or negative. The incentive based instruments too, require monitoring like in the case of prescriptive instruments. The purpose, though is to estimate the value of the incentives (OXERA, 2003). Table 3 below gives examples of the types of instruments listed above.

Table 3 Instrument types with examples

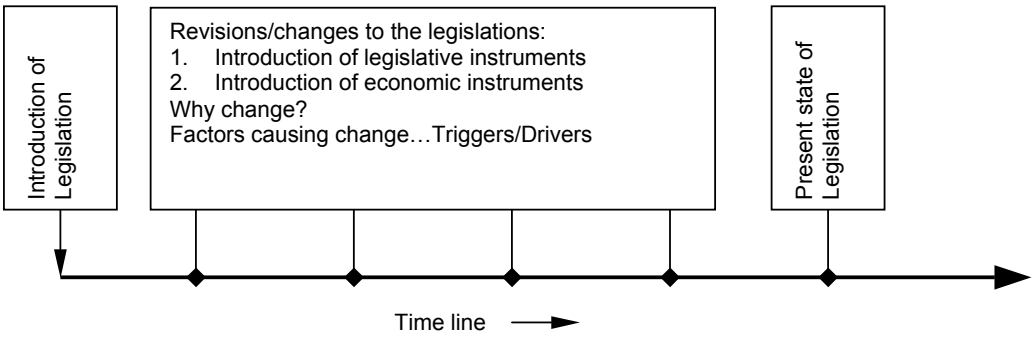
Instrument Type	Examples	Based on
Prescriptive instruments	Standards, permits for extraction and discharge, prohibitions and authorizations	Legislative approach
Incentives (positive and negative)	Subsidies, low interest rate or government guaranteed loans, taxation/charges, licence withdrawal	Economic regulatory approach

In addition to the above-mentioned instrument types there are also the information instruments and the voluntary or self-regulation instruments. These types of instruments are normally not applied in isolation all by themselves. They cause maximum benefit when applied in combination with the other instruments.

2.5.3 Methodology

The objective of this research is to be able to answer the two research questions as mentioned in the section 2.4. In order to answer the question regarding the change in approach, evolution of the legislations over the period of time since they were first introduced will be studied. Diagrammatically the approach of this part of the framework can be represented as shown in Figure 1.

Figure 1 Diagramatic representation of the partial framework



The second research question regarding the need for change in approach will be answered in the following manner. A systematic analysis of the legislations will be performed to answer the following questions:

1. What are the objectives of the legislations?
2. What is the rationale?
3. Who are the actors of implementation?
4. Who constitute the target groups?
5. What instruments are being used in the legislations?

What does emerge from the answers to the above questions is a snapshot view of the legislations as they are at present. Further, the analysis helps in getting a better understanding as to how the particular legislation regulates the water supply and wastewater sector.

By conducting case studies it will be possible to understand how the operators implement the provisions of the legislations. The four basic themes on which the case studies have been conducted include:

1. Technological innovations: In order to adhere to the requirements of the legislations did the operators have to go in for a new technology, either develop it themselves or invest in it?
2. Financial pressures: Did the requirements of the legislations induce financial pressures on the operators?
3. Organisational changes: Did the requirements of the legislations bring about any changes in the operator relating to legal status or size?
4. New stakeholders: Did the requirements of the legislations force the operator to engage service providers or new parties that he had not (or sparsely) dealt with in the past?

From the results of the systematic analysis and the case studies it will be possible to identify gaps in the stated objectives of the legislations and the extent to which they have been realised (by the sector). These results it is felt hold the key to the reasons for change in approach.

Table 4 Summary of research questions

Main Questions	Sub questions
Is there an evolution in the water supply and wastewater sector from a legislative approach to a more economic regulatory approach in the Netherlands?	1. How is the sector organised? Who are the main actors and what are their roles? 2. How have the policies developed since being implemented for the first time?
Why did the evolution in the legislations happen (if there is any evolution at all)?	1. What factors are causing the change? 2. Are there specific triggers/drivers that caused these changes? 3. What is in the legislations? 4. How do the operators implement the policies?

3 DUTCH WATER SUPPLY AND WASTEWATER SECTOR

Section 2.1 outlined the historical development of the Dutch water supply and wastewater sector. The current chapter will further improve the understanding of the Dutch water supply and wastewater sector. Having a clear understanding of the various aspects of the Dutch water supply and wastewater sector helps a great deal in following the analysis performed subsequently in this research. It also contributes to the readers understanding of various issues that are being targeted by the legislations and regulations. This chapter describes the institutional setting and the various actors involved in the water supply and the wastewater sector in the Netherlands. A brief statement regarding the water availability and its various uses is made as a preamble to the descriptions on the institutional set up and the organisation of the various actors.

3.1 WATER AND ITS USES

Water covers approximately 15% of the surface of the Netherlands. Ample amount of water is available under average conditions throughout the year. 63% of the total inflow originates from the river Rhine. Other rivers include Meuse, Scheldt and the Eems. All the rivers together contribute about 73% of all the inflow; rain is responsible for the rest of the 27% (Perdok, 1995). It may be worth noting here that the Netherlands is largely dependent of external sources for its surface water needs. In more than 90% of the country groundwater level is less than 4 m below the surface level (Koreimann et al, 1999). Of the 775 mm of rainfall that Netherlands receives in a year about 200-300mm reaches the groundwater after evapotranspiration. Only a portion of this groundwater is available for drinking water uses, due to the fact that excessive extraction of groundwater causes the water table to drop (VROM, 1994).

There has been a fall in the groundwater levels at an average rate of 20 cm since 1950 in the woodland areas and an average of 50 cm in the manmade landscapes in the Netherlands (Perdok, 1995). In response to the falling groundwater levels the authorities have been promoting the use of surface water against groundwater for drinking water production. The result though is not very encouraging, a miniscule drop to 62% as of the year 2001. Also sometimes the Water Companies may choose surface water sources over the groundwater sources in the event that these are polluted; especially by nitrates and pesticides. This increased dependence on the surface waters has resulted in a drastic change in the way the Water Companies view the pollution of potential surface water sources. Water companies are becoming more and more proactive in fighting pollution and have thus positioned themselves as "environmental watchdogs" (Schwartz and Roosma, 1999).

Drinking Water Companies use approximately 10% of the total water extracted in the Netherlands. Depletion in the Netherlands is described as a serious threat in several policy reports. Farmers cause 60% of the depletion problems. Drinking Water Companies are responsible for 30% of the depletion effects (CIW, 2003).

About one third of the drinking water is produced from surface water and the rest of the two thirds is produced using ground water (Kuks, 2003a). VEWIN (2002) reports the following figures of extraction for producing drinking water in the year 2001: ground water, 758 Million m^3; river groundwater, 26 Million m^3; natural dune water, 16 Million m^3; surface water, 503 Million m^3.

3.2 INSTITUTIONAL FRAMEWORK

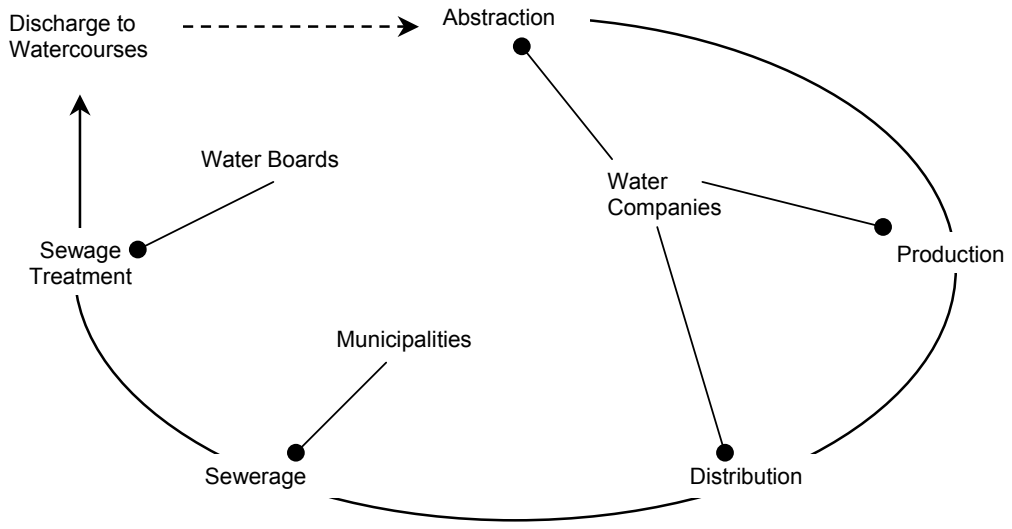
The Netherlands is often described as a unitary decentralised state. Consensus forms a key part of the decision making process in the Netherlands. Three hierarchical levels of government can be

distinguished, the State (or Central/National Government), the Provinces and the Municipalities. A unique feature of the Dutch system of water management is the Water Boards. The Water Boards are special, democratically elected government units responsible only for water management.

The water supply and wastewater services operate more or less on a local to regional level. Although the Ministries of Housing, Spatial Planning and Environment (VROM) and the Ministry of Transport, Public Works and Water Management (V&W) are the responsible authorities in the end, daily responsibilities are delegated to the lower governing bodies. The responsible governing entities for different parts of the water cycle are distinct. Drinking Water Companies are responsible for the water supply. The drinking Water Companies operate under company law, but are owned by the public sector completely. The shareholders are the Municipalities and/or Provinces. Besides being the most important shareholder of almost every Dutch water company, the State has delegated the supervision of the groundwater quantity management to the Provinces. The Provinces are authorised to supervise the groundwater extractions and are able to authorise or recall abstraction permits.

Municipalities and the Water Boards are responsible for the sewerage and the treatment of wastewater respectively. The Water Boards are also responsible for the quantity and quality of water in the surface waters under their jurisdiction. For larger water bodies of national significance the V&W is responsible through its executive department the Rijkswaterstaat. Figure 2 below shows the various parts of the water cycle and the actors responsible for the same.

Figure 2 Water cycle and it relevant actors



Consequence of this division of tasks within the water cycle is that the co-ordination of activities within the Dutch water sector is essential and strong ties are created between the different actors.

Two groups of actors can be identified in the Dutch system of water management. The primary actors are the ones that are directly involved in water management either by way of policy development or by way of execution. The state, the Provinces, the Municipalities, the drinking Water Companies and the Water Boards constitute this group. There is a second group of actors identified here that are involved in the water management tasks but less directly. The representative organisations, VEWIN (association of drinking Water Companies), Unie van Waterschappen (Association of Water Boards), VNG (Dutch organisation of Municipalities), the

banks, Dutch Water Boards Bank and the Dutch Municipalities Bank and the private firms constitute this group. A diagrammatic representation of the organisation of the sector is included in the Figure 3 at the end of this section.

3.2.1 State (Central Government)

The Ministry of Transport, Public Works and Water Management (V&W) and the Ministry of Housing Spatial Planning and Environment (VROM) are the two most important ministries involved directly in the water supply and wastewater sector. The V&W is finally responsible for sewage treatment and surface water quality and quantity, while, VROM is responsible for drinking water and its quality. Inspectors from the Ministry of VROM supervise the quality of the drinking water produced. The V&W and the Institute for Inland Water Management and Wastewater Treatment (RIZA) are the main preparatory bodies for new legislations/regulations (Perdok, 1995).

3.2.2 Provinces

There are in all 12 Provinces. The provincial level is the one where most of the vertical and horizontal coordination of the government is concentrated. Most importantly the Provinces are required to coordinate policies of the various sectors like the environment, transportation, nature housing, physical planning etc. The Provinces receive the directives from the central government and pass it on to the Municipalities and the Water Boards for implementation, but they may have their own policies. In addition to the above-mentioned responsibility the Provinces also act as representatives of Municipalities and Water Boards in front of the central government. The Provinces are also responsible for the groundwater management, though not exclusively (Perdok, 1995). Provinces also are shareholders in the Water Companies and have the power to either establish or abolish a water board.

3.2.3 Municipalities

Municipalities are responsible for the collection of waste and storm water. The Municipalities are represented by the VNG, who advice the Municipalities on request. In all there are 537 Municipalities as of 2003. The Municipalities jointly with the Provinces are shareholders of the Water Companies.

3.2.4 Water boards

The Water Boards are functional governing bodies, whose councils are democratically elected by specific interest groups. Being a democratically elected governing body the Water Boards are independent and have their own areas of authority. They are also empowered to draw up regulations, which citizens must observe. The Provinces define the tasks of the Water Boards. The Water Boards are responsible for quantity and/or quality management based on the type to which they belong. The Provincial Council has the power to establish or abolish a water board. The Water Boards operate on the triplet "interest-pay-say", which means that those who have an interest and who pay have a say (through elected representatives) in the water board council (Perdok, 1995).

3.2.5 Drinking Water Companies

Most of the drinking Water Companies in the Netherlands are based on a mode of organisation where the utility is incorporated as a limited company under the company law, but Local, Provincial and/or National Government holds the shares. The essence of the Public Limited

Companies (PLC), as it is often referred to, is that the company law acts as a buffer, shielding water services from the burdensome public sector rules and regulations (Blokland et al, 1999). The Water Companies are responsible for the continuous provision of drinking water in their respective areas in accordance with the Water Supply Act. Although there are 17 drinking Water Companies at the moment (year 2003), there is a trend towards concentration as has been in the past, and the number may further fall.

3.2.6 VEWIN

VEWIN is the main interest group for water supply companies. VEWIN was formed in 1952 as a spin off from VWN. VWN, the cooperation between Water Companies was originally formed in 1899 and was founded with the primary aim of increasing knowledge between water supply companies. VEWIN's aim is to "promote a healthy development of public water supply in the Netherlands". Further it also seeks to promote the interests of the Water Companies as long as these interests do not conflict the earlier stated motive.

VEWIN is responsible for various activities like producing publications about various aspects of the drinking water sector; development of ten year plans (mid term plans), lobbying for the Water Companies for or against the government policies (Schwartz, 1999). VEWIN is responsible for the system of benchmarking which looks at four aspects; drinking water supply, cost efficiency, environmental performance and service performance. VEWIN is also a member of the EUREAU, the European Union of National Associations of Water suppliers and wastewater services.

3.2.7 Union of Water Boards (UvW)

The UvW is the union of Water Boards and is responsible for protecting the interests of the Water Boards at the National level. All Water Boards are members of this association. On behalf of the Water Boards the UvW acts like a spokesperson to the parliament, public authorities and other organisations. The UvW is a partner in issues of strategic water management and legislation. With the Water Boards, the UvW looks for solutions to common problems (Unie van Waterschappen, 2003). The UvW is also responsible for organising the benchmarking system among the Water Boards that treat wastewater in which 20 of the 48 Water Boards participate. The benchmarking exercise is voluntary and used more as a ranking system for the following parameters customer satisfaction, treatment plant performances, environment and technological innovation (Kuks, 2003b).

3.2.8 RIONED

The RIONED Foundation is actively engaged in many important aspects concerning sewerage systems in the Netherlands. The foundation is a cooperative organisation of public bodies, industry and educational institutions. RIONED collates all information regarding the governmental, technical and financial aspects of sewerage management through surveys and other methods. RIONED is active in the development of cost-saving techniques and methods. This information is available to the municipal and other governmental authorities, which are effectively supporting the RIONED foundation, allowing them to implement their plans as efficiently as possible (RIONED, 2003). RIONED is also responsible for conducting a benchmarking exercise for the sewerage using the following performance indicators: nuisance/customer satisfaction, insight situations and functions, environment, organisation capacity and expenditure.

3.2.9 Dutch Water Boards Bank (NWB)

Nederlandse Waterschapsbank N.V. (NWB) provides services exclusively to the public sector, arranging funding for the Provinces, Municipalities and Water Boards. It grants long-term loans to public housing, healthcare and education institutions. In addition, NWB finances public water supply and environmental corporations. NWB is fully owned by public sector authorities. It finances its activities on the international money and capital markets, making use of financial instruments such as debentures, Medium Term Notes and commercial paper. The Bank's financial position is very strong and it has been awarded AAA ratings by Moody's and Standard & Poor's (NWB, 2003).

3.2.10 Dutch Municipality Bank (BNG)

The Dutch Municipality Bank (BNG) lends exclusively to the public sector, much like the NWB. The State owns 50% of the shares while Provinces and the Municipalities together own the other 50%. According to the balance total the BNG is the largest public bank in the Netherlands (BNG, 2003).

3.2.11 Private parties

Privatisation of the Dutch water services has been in the past and is still a hotly debated issue. There are two parties: one pro-privatisation (industries and privatised energy utilities) and the other against (drinking Water Companies and Water Boards). Although in the past there has been some privatisation in the drinking water sector (NUON), currently there is only one small private drinking water company, serving the town of Doorn. This company has an annual production of 2.5 Million m^3 (2001 figures). In the wastewater sector water board Delfland has recently executed a DBFO contract with a consortium of companies (Foreign and Dutch) called Defluent for building a wastewater treatment plant at Harnaschpolder near Den Haag. This is the first of its kind in the Dutch water supply and wastewater sector. Further details of this DBFO contract are discussed in section 8.5.

3.2.12 Medium and large scale consumers

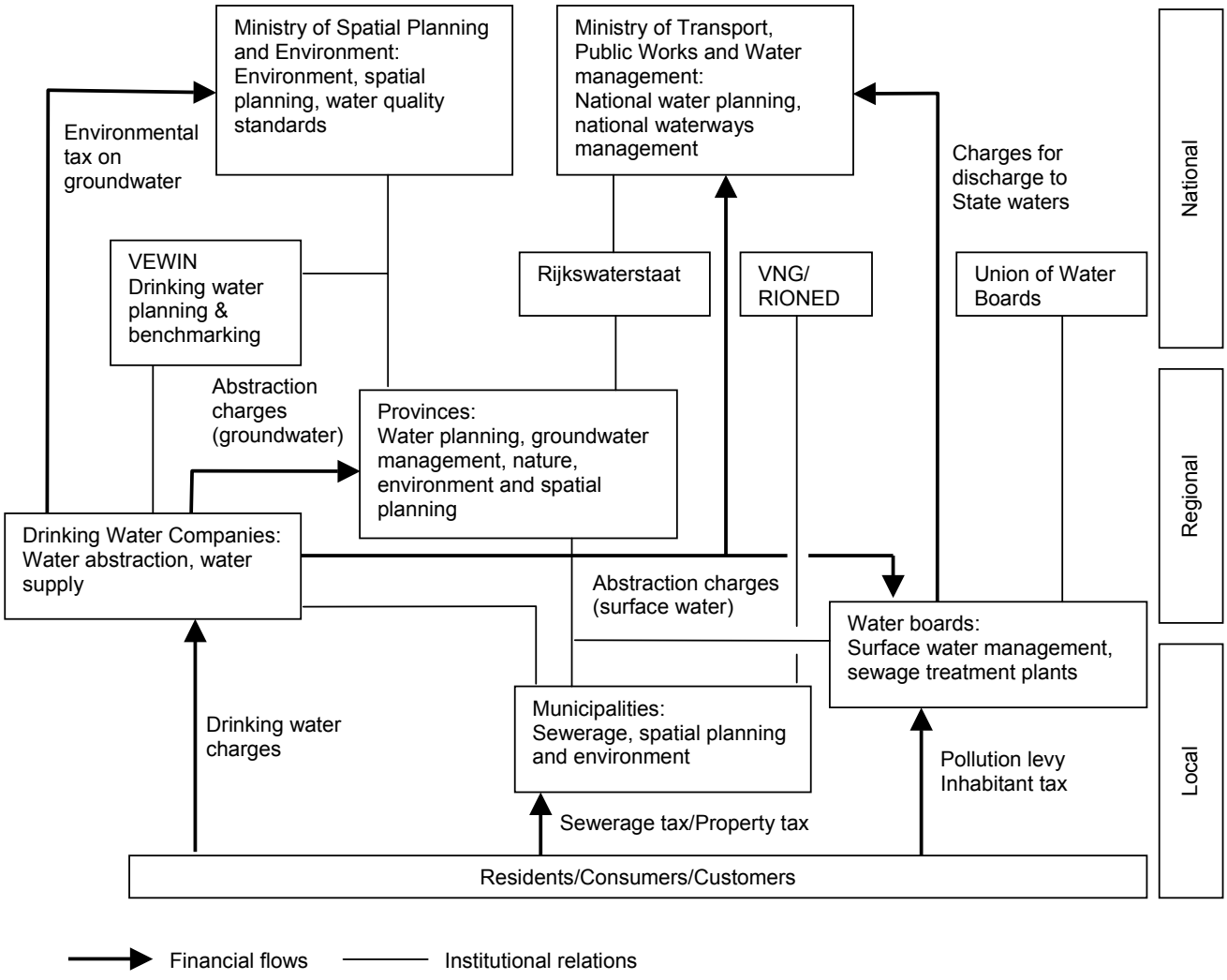
About 35% of the drinking water in the Netherlands is supplied to industries termed as medium or large users. These account for 279,462 medium scale user connections and 4,294 large-scale consumers in a total of 7,165,593 (VEWIN, 2002). The medium scale users consume more than 300m^3/year but less than 100,0000 m^3/year. The large-scale users consume more than 100,000 m3 of drinking water in a year and are represented by the VEMW (organisation which takes care of the interest of large scale consumers of water and energy). In an upcoming revision to the Water Supply Act provisions are being made to allow these large-scale customers to choose their own supplier. It is expected that this will lead to competition will ensure maximum benefit to these customers in the form of cost savings and variety of services. In most cases for these large customers, there is a tendency of pre treatment of wastewater, due to the presence of specific pollutants and also to lessen the pollution charges that needs to be paid.

3.2.13 Small users

The small-scale consumers account for about 60% of the water consumption. In all across Netherlands there are 6,881,837 connections classified as small-scale consumers. Since the mid nineties the average drinking water use per person slightly decreased (VEWIN, 2002). However because of the increase of the total population the net result is not significant. In the last decade the drinking water production has been stabilised as a result of the stabilisation of the

consumption. Figure 3 gives an impression of the Dutch water supply and wastewater sector, its various actors and the interlinks between them.

Figure 3 Organisation of the Dutch Water Supply and Wastewater Sector



Based on Perdok, 1995

4 GROUNDWATER ACT

4.1 ORIGIN

The Water Supply Companies (Groundwater) Act (WSGA) of 1954 was the predecessor to the Groundwater Act (GWA) of 1981. The WSGA Act was implemented in order to guarantee constant and undisturbed water supply. As per the provisions of the act, landowners had to allow extractions from aquifers below their properties even though the withdrawals could perhaps, negatively affect them. The WSGA also created a concession system, which started the process of institutionalisation of the water supply sector (Kuks, 2003a).

As against this, the GWA of 1981 aimed at regulating all extractions of groundwater and not only extractions by water supply companies. While the WSGA aimed to serve public supplies better, the GWA intended to redistribute extraction rights among all users with extractions above 100,000 m^3/month, by creating a concession system. An important change that the GWA brought about was that it proclaimed that the interest of public supply could no longer dominate the deliberation of interests. Essentially it meant that all interests would have to be treated in an equal way, which indicated that not all demands nor any specific demand could be met anymore in an unlimited amount. The GWA also allowed groundwater extractions to be charged by the Provinces the revenues of which had to be used for anti-desiccation measures (Kuks, 2003a).

4.2 EVOLUTION OF THE GROUNDWATER ACT

In the following paragraphs the revisions to the GWA are described. None of the revisions add to either the legislative or economic regulatory character of the Act. Nevertheless the revisions that have been traceable have been reproduced herewith.

As of the year 1992 the GWA had been already amended to include the following (FAO, 2004):

1. Section 14 of the act of 1992 stated that "Abstraction of groundwater or infiltration of water in groundwater requires a licence issued by provincial authorities and such activities shall be notified to those authority on a monthly basis".
2. The section 13 stipulated that the provincial secretariat maintain a register of licences and monthly reports submitted to the Provinces.
3. Section 14a of the revised act stated, "a licence shall only be granted if no danger of water pollution exists".

In 1993 the GWA was revised in order to implement the requirements of the Groundwater Directive (80/68/EEC) of the EC. The revision restricted the powers of the Provincial Councils to grant permits for infiltration of water in case of a danger of expected groundwater pollution (Bennet, 1986).

In the year 1995 the GWA was revised to add articles 15a and 15b which make better provisions for the small abstractions, temporary abstractions. The revision also authorised the Provincial Executive to prohibit abstraction under circumstances, which are specified in the Provincial Ordinances in order to protect interests affected by groundwater management (FAO, 2004).

In the year 1996 the GWA was amended again; changes were made to the provisions of the following sections (FAO, 2004):

1. Section 15a: The prohibition to abstract groundwater

2. Section 30: The applicability of certain provisions of the Environment Management Act on the granting or modification of licences to abstract groundwater or to recharge groundwater
3. Section 41: Compensation of damages as a result of withdrawal or modification of the licence by provincial authorities
4. Section 48: charges on groundwater abstraction

4.3 SYSTEMATIC ANALYSIS OF THE GROUNDWATER ACT

4.3.1 Objectives

"To foster proper management of groundwater through rules laid down for abstraction of groundwater and infiltration of groundwater"

4.3.2 Rationale

By making it mandatory to have a licence to abstract groundwater or infiltrate water into the ground the act hopes to be able to manage groundwater resources in a sustainable manner. Charging groundwater abstraction will encourage drinking Water Companies to change their raw water source from groundwater to surface water and promote sustainability of water resources.

4.3.3 Actors of Implementation

The major actors of implementation for the groundwater act are the Provinces. The authority charged with licensing is the provincial executive, they are empowered to grant, revoke and amend the licences as may be required. The Provincial Councils have been empowered to adopt ordinances with regard to a number of issues relating to groundwater such as protection of interests affected by groundwater management, information to be supplied with application for licences, when the provincial groundwater committee should not be given an opportunity to make recommendations etc. Officials designated by the provincial executive are also responsible for monitoring compliance towards provisions of the Act.

4.3.4 Target groups

The Groundwater Act identifies groundwater abstractors and infiltrators of water as the primary target group. As much as 62% of the drinking water in the Netherlands is prepared using groundwater. As a result the drinking Water Companies or water abstraction companies that abstract water and then sell it to the Water Companies are being targeted by this legislation.

4.3.5 Instruments

Prescriptive

1. The Act makes it obligatory for anyone who abstracts groundwater or infiltrates water into the ground to report the existence of such an installation and maintain records of the amounts of groundwater extracted or water infiltrated into the ground (Section 11 subsection 1).
2. The provincial executive is required to maintain a register, which has the details of all the installations within the province where it lists the details of all the installations as provided by the installation owners. (Section 13 subsections 1&2).
3. A licence for infiltration of water may be granted only in cases if there is no danger of groundwater being contaminated. Assessment of the dangers is done in accordance of section 13a of Soil Protection Act. Conditions to ensure the quality of groundwater is monitored and will in any case be attached to the licence (Section 14a subsection 1&3).

4. It is prohibited to either abstract groundwater or infiltrate water into the ground without a licence granted by the Provincial Executive. Exemptions to this rule are when the abstraction is less than $10m^3$/hour or in cases of emergency. The licence itself may contain statements about the amount of water that may be either abstracted or infiltrated, period of time over which this may be done and the purpose for which the water is either abstracted or infiltrated (Section 14 subsections 1,2&4, Section 15 subsection 1).
5. Damage to property by way of activities of groundwater extraction or infiltration of water into the ground, shall either be rectified by the licence holder, or in cases of the damage not being rectified compensation needs to be paid. The owner of the property may also demand that the licence holder acquires the possession of the property in cases of extreme damages where the ownership of the property itself may be of little consequence to the owner (Section 35 subsections 1,2&3).
6. Officials designated by the Provincial Executive shall be responsible for monitoring compliance with provisions laid down by the act and shall have unlimited access to all places except private homes to measure the amount of groundwater being abstracted or water being infiltered (Section 49 subsections 1&2).

Incentives

1. Provincial councils are authorised to institute levies in the form of Provincial taxes for abstraction of groundwater to meet the costs of carrying out investigations required for groundwater management. Operators of installations abstracting groundwater are subject to these levies, based on the amount of groundwater extracted. In case water is being infiltrated into the ground under the terms of licence, this shall be taken into account in the imposition of the levy on the licence-holder (Section 48 subsections 1,2&3).
2. In case of actions against the interests of protection of groundwater, the Provincial Executive may revoke a licence all by itself or on request from any interested party (Section 23 subsection 1).

4.4 EFFECTS OF LEGISLATION

The rationale based on which, the GWA regulates groundwater abstractions has not been able to realise its objectives. This may be attributed to the fact that the Act has been continuously pursuing the same approach with which it started off in the first place. In order to suppress the effect on the environment a new environmental taxation on the groundwater was initiated in 1995. The primary objective of the tax is to raise revenue. The secondary aim is to generate a positive environmental effect. The policy aims are at conserving water to secure future water supply and to mitigate environmental effects of groundwater extraction.

Based on literature available on this subject it is clear that groundwater depletion is a major problem in many parts of the Netherlands. In all 10% of the total area of the Netherlands is affected by a permanent lowering of groundwater tables (Kuks, 2003a). A target was set in 1985 to reduce the desiccated area by 10% by 2000. This target has not been achieved. The Third Environmental Policy Plan hopes to realise a 40% reduction in the depleted areas by 2010. Until now there was no evidence that the 1995 environmental tax has had any positive effects as far as actual water savings are concerned (VROM, 2001).

4.5 OBSERVATION REGARDING THE GROUNDWATER ACT

The answer to the first research question in regards to the GWA is that the GWA has not evolved from a legislative approach to an economic regulatory approach. Like noted at the beginning of the section 4.2 none of the changes to the GWA have added to either its legislative character or its

economic regulatory character. Most of the revisions to the GWA only made some changes to the provisions already in place.

The second research question tries to understand why the changes were necessary. In light of the fact that there have not been any changes in the approach of the GWA, it is difficult to answer this question.

The problem that seems to be hogging the GWA is that the incentive instruments have proved to be less effective than expected. This can be attributed to the fact that the charges for abstraction are quite low. Provincial levy for abstraction in the case of North Brabant is 0.0136 Euro/m^3 and the environmental tax for the water supply companies amount to 0.15 Euros/m^3. Smaller extractions of less than 10m^3/hour are exempt from the environmental tax. The result is that many farmers have their own wells thus negating the effectiveness of the tax (Hellegers and van Ierland, 2003).

In conclusion what may be required for the GWA to realise its objectives is to approach the problem of desiccation with a new approach. Policy instruments like the deposit refund scheme, information and self-regulation might be of help. For example based on historical consumption patterns, the abstracters may be asked to deposit a certain amount. Based on the actual consumption a portion of this may then be refunded. Information instruments will particularly useful in case of small abstractors. These new approaches may prove to be more helpful in realising the objectives of the GWA.

5 WATER MANAGEMENT ACT

5.1 ORIGIN

The Water Management Act (WMA) was adopted in 1989. This Act has been a real transition towards integrated water management, since it considered the entire water system and the interconnectedness between surface and groundwater, being a necessary step towards a "basin" approach. The WMA provided instruments for the level control of surface and groundwater, which could restrict all user rights affecting water tables, not only to prevent water depletion, but also to protect ecosystems. So, another reason why this Act has been a transition towards integrated water management is that it allowed a deliberation of interests also taking ecological aspects of the water system into account. The WMA has been a vehicle for the regional Water Boards. It is on the basis of the WMA that they issue ordinances for the regulation of water uses and to protect the natural and ecological values of water systems (Kuks, 2003a).

5.2 EVOLUTION OF THE WATER MANAGEMENT ACT

In the following paragraphs the revisions to the WMA are described. None of the revisions add to either the legislative or economic regulatory character of the Act. Nevertheless the revisions that have been traceable have been reproduced herewith.

In 1995 the sections 34 and 35 of the Water Management Act were revised to amend certain provisions to the system of permits and the regimes in extraordinary circumstances (FAO, 2004).

In 1999 a Decree to the Water Management Act was issued that provided for the indication of public waters as subsidiary arteries of principal arteries in the sense of the Executive Decree Water Management. The indication implied that provisions of the PSWA and the WMA might be applicable to the waters connected to the principal State waters. The principal waters and the indicated subsidiary waters thus form one entity for the purposes of water management. Indication is necessary because management of the subsidiary water separately from management of the main water is considered ineffective (FAO, 2004).

5.3 SYSTEMATIC ANALYSIS OF THE WATER MANAGEMENT ACT

5.3.1 Objectives

"…Coherence and efficiency of policy and administration in respect of water management as a whole and quantitative control of surface waters."

5.3.2 Rationale

A coherent and efficient policy towards water management will promote sustainable use of water resources.

5.3.3 Actors of implementation

The main actors of implementation are the central government and the Water Boards. Rijkswaterstaat, the executing agency of the V&W, is responsible in cases of national or state waters, for the other waters the Water Boards are responsible. Municipalities also retain powers to issue ordinances as long as they do not conflict with provisions of this act.

5.3.4 Target groups

The two relevant and important target group members are the Water Companies and the Water Boards. The Water Companies since they abstract water for preparing drinking water and the Water Boards since they discharge treated water into surface waters.

5.3.5 Instruments

Prescriptive

1. The V&W is responsible for drawing up a policy plan for the main elements of policy related to water management. This plan is revised once in 4 years at least. Further to the policy document the Act requires the V&W the Provinces and the Water Boards or water controllers to draw up their own plans for water management, also to be revised once in 4 years at least. The plans are supposed to indicate functions of surface waters, program of measures and provisions required for development, operation and protection of water management systems, protection of the environment, financial resources required to implement the program and the intended time scale. While drawing up the plans the Provinces need to include groundwater management too and the Water Boards need to take cognisance of the provincial water management plans. V&W can issue instructions such as time limits within which the plan must be adopted etc, to Provincial Councils concerning adoption or revision and content of the Provincial Water Management Plan (Section 3,5,7,9&10).
2. In cases of transfers of water from one Water Board to another, both are jointly obliged to enter into a water agreement, involving a Water Board that concerns itself with quality issues only if required. This water agreement has to take into account the management plans mentioned earlier (Section 17 subsection 1).
3. All transfers of water, discharges in to, or abstractions from surface waters need to be measured, recorded and reported to the V&W in case of national waters and to the Water Boards in case of other waters. An overview of the data presented by various persons is available for examination at the provincial secretariat free of charge (Section 12 subsection 1,2&3).
4. It is prohibited that anyone else other than the Water Boards discharge water into or abstract water out of surface waters, without a licence. The licence indicates the amounts of water that can be transferred, discharged or abstracted in a given period of time. Conditions may also be attached to the licence pursuant to provisions laid down in PSWA and the GWA (Section 24 subsections 1,5&6).
5. In cases of major water shortages or major surpluses or significant quality deterioration, general regulations may be issued by the Water Boards restricting or completely banning transfer, discharge or abstraction of water (Section 37 sub section 1).
6. Compensation needs to be paid (either money or other form) to person/persons who suffer damage as a result of the either granting or revocation or amendment of a licence or the adoption of a water level order.
7. Designated officials shall in so far as it can be reasonably considered necessary for performing their duties, have power to enter all premises with exception of dwellings in order to measure the amounts of water transferred, discharged or abstracted (Section 54 subsection 1).

Incentive

1. The Water Boards may, by their initiative or on the request from an interested party amend or revoke a licence in whole or part. A licence may also be revoked in whole or part if the licence is contravened or facts or circumstances come to light as a result of which in the

interest of water management in so far as these are not protected by PSWA or GWA, discharges, abstractions and transfers of water are no longer considered admissible (Section 30 subsection 1,3d&3e).
2. In cases where either the Act itself or provisions of the act or the conditions laid down in the licence are contravened, the act empowers the relevant authorities to take correctional measures at the expense of the offender (Section 58 subsection 1).

5.4 EFFECTS OF THE LEGISLATION

The WMA's objectives revolve around the concepts of coherence and sustainable use of water resources. The two objectives are somewhat interrelated; coherence in policy promotes sustainable use of water resources. These objectives of the WMA have been reached partially. Coherence in policy towards water management has been achieved by the various links between the WMA, the GWA the PSWA and the EMA. The 1999 revision also adds to the coherence in the activities of the actors at different levels, namely the Central Government and the Provinces and Water Boards.

5.5 OBSERVATIONS REGARDGING WATER MANAGEMENT ACT

The answer to the first research question with regards to the WMA is that the WMA has not evolved from a legislative approach to an economic regulatory approach. As noted earlier in the section 5.2 no new instruments have been added and the act has retained its original nature.

The answer to the second research question is less relevant here due to the fact that the changes made to the act have in no way altered the approach. The 1999 revision, though adds an interesting perspective to the Act. It reinforces the need for cooperation between the various actors involved in management of water in the Netherlands. In doing this, the decree is strengthening the Act and thus improving the chances of realising the objectives.

6 WATER SUPPLY ACT

6.1 ORIGIN

The first ideas of the legislation of the water supply sector dates back to the year 1868, as a part of the report to the King. The Water Supply Act is based on a report that was published in 1940, by the State Committee for Water Supply. There was resistance from the water industry due to the fact that they viewed such a law as granting absolute power to the Central Government. The other objection was that since they were already performing well, there was no need for such a law at all, so they felt. VEWIN was formed in the year 1952 and a more structured dialogue between the central government and the water industry was thus possible. The Water Supply Act was implemented in the year 1957. The law contained performance requirements, regulated the monitoring of the drinking Water Companies and also authorized health inspections (Klostermann, 2003).

Klostermann (2003) also quotes Leeflang (1974) about the intention of the central government to reduce the number of Water Companies by way of mergers, by making provisions in the WSA. The tendency to merge Water Companies was also supported by the Provinces.

6.2 EVOLUTION OF THE WATER SUPPLY ACT

In the following paragraphs the revisions to the WSA since the time of its implementation have been listed. These revisions have reinstated the legislative nature of the WSA. Most of the revisions have added prescriptive instruments to the WSA. The only possible incentive based instrument is still under discussion and may be added later this year (2004).

The earliest of the revisions to the WSA happened in the year 1960. A Decree was issued in the said year that prescribed the quality of drinking water. The Decree was the primary instrument for regulating water quality until the 1980s when the Drinking Water Directive of the EC was put forward (Bennet, 1986).

In the 1970s central government started to promote the idea that in order to be able to meet future challenges the Water Companies need to have a minimum size of at least 100,000 connections, a laboratory for quality control and appropriate management, expertise and organisation. Accordingly in 1975 the WSA was amended and the Provinces were entrusted the task of reorganising the water supply sector and awarded with required instruments. The Provinces were now authorised to make and conclude reorganisation plans of the water supply sector (Dane and Warner, 1999).

The requirements of the Drinking Water Directive of the EC were applied in the Dutch Water Supply legislations by the amendment of the 1960 Decree in the year 1984. In spite of the fact that the Decree laid down values for a number of parameters for drinking water, the scope was insufficient. The amendments of 1984 required that the drinking water comply with four categories of parameters (Bennet, 1986):

1. Values that could not be exceeded under any circumstances
2. Minimum values for drinking water that has to be softened or desalinated
3. Values that may be deviated in case of exceptional conditions
4. Values that may be deviated in cases where it would be unreasonable to comply

Monitoring details are also set out in greater detail in the amended decree, including details such as method of measurement, unit of measurement, degree of accuracy, detection threshold and

standard value. In most cases the specified methods conformed to the (80/778/EEC) Drinking Water Directive (Bennet, 1986).

The period between 1995 and 2000 was dominated by the debate on liberalisation of the water supply sector. Around 1996 the VROM opened the debate on revision of the Water Supply Act and included liberalisation as an option. The debate between the pro liberalisation and anti liberalisation raged until the year 1998. In 1998 a new Minister for Environment was appointed who chose to have a public monopoly system. However, intentions were expressed to allow large customers (consuming more than 100,000m3/year) to choose their supplier(s). This revision to the WSA is still in discussion and is expected to materialise by the end of 2004.

In the year 2000 the WSA was revised to implement the Council Directive 98/83/EC on the quality of water intended for human consumption. Three new Chapters (Separate water Supply [IIA]; Rules relative to private water supply installations [IIB]; Report on the quality of supplied water [VA]) were added to the principal Act. Consequential amendments were made to the other Chapters. Regulations related to separate water supply - the supply of drinking water through a pipe system either bound to a particular piece of land or within the sphere of (offshore) mining operations – were added to Chapter IIA. Rules relative to the responsibility for the quality of water so supplied, and inspection of separate water supply were specified therein. Rules relating to various matters such as the quality of water supplied by through private supply systems (as defined) were laid down in the chapter IIB. These rules provide for the duty of the supplier to communicate to users certain measures to be taken in the case of risk to public health, measurement of water quality to be prescribed by an Order in Council, and inspection of quality. In accordance with provisions contained in Chapter VA the Minister of Housing, Spatial Planning and Environment shall draw up each year, a report on the quality of water supplied through pipe systems.

6.3 SYSTEMATIC ANALYSIS OF THE WATER SUPPLY ACT

6.3.1 Objectives

“Contribute to the improvement of public health by providing safe and sustainable drinking water services”

6.3.2 Rationale

Public health is protected and improves when wholesome drinking water at required pressures is provided.

6.3.3 Actors of Implementation

The Inspectorate for the Environment, a part of the VROM is the responsible entity in the case of drinking water production and supply. For the sake of the health issues of the personnel working at the treatment plants the medical inspectors are responsible. VEWIN through its benchmark (water quality index in this case) also exerts pressure on the Water Companies to keep up the performance.

6.3.4 Target groups

The Water Companies are the primary targets of the legislations. Also included are any companies that may be charged with extraction of water to prepare drinking water.

6.3.5 Instruments

Prescriptive

1. The act directs the Water Companies to supply wholesome drinking water to the users in quantities and pressures required, in order to protect public health. Requirements related to the following may be laid down in the order in council (Section 4 subsection 2):
    a. Quality of drinking water supplied by the companies
    b. Volume of water supplied and the pressure at which it needs to be supplied
    c. Design of operational parts of the Water Companies, the way in which the operations of the Water Companies are carried out
    d. Required monitoring for operations of the company and the quality of water produced by the company
    e. Competence of personnel working in the companies
    f. Provision of information on the personnel
    g. Design and inspection of pipes and appliances connected to the company networks
2. An order in council may prohibit a water company from preparing drinking water from surface water that fails to meet requirements laid down in the order, this may not apply to water that is pre-treated in a manner specified in the order in council (Section 4 subsection 4 and Annex D of the Water Supply Decree).
3. In the interests of public health the Water Companies are required to provide all relevant information and assist in all investigations by the inspectors (Section 5 subsection 1).
4. Water Companies are obliged to ensure that the personnel whose work on specific installation may lead to contamination of water undergo medical examinations and also that they are not allowed to undertake work in case of any disease as specified by an order in council (Section 9 subsection 1).
5. The Water Companies are obliged to take measures to guarantee, to the greatest extent possible the continuation of services in event of war or other exceptional circumstances (Section 14a subsection 1)
6. Water Company owners are prohibited from modifying, extending, constructing or using water supply works in contravention of the provisions of a medium-term plan approved pursuant to section 54 subsection 1 (Section 58).
7. The Water Supply Decree details regulations governing the preparation of drinking water from surface water as per the assigned category of the surface water and the requirements mentioned thereby in the annex D of the Decree (Article 17a). The Water Supply Decree also specifies the requirements that the drinking water needs to satisfy as laid down in the annex A of the decree.
8. The Water Companies are required to keep information referred in the annex B of the decree for a period of at least 5 years and report the same within 6 months of the end of each calendar year.
9. The Act requires the VROM to draw a policy plan that outlines the principles to ensure a reliable supply of drinking water and industrial water. This policy plan is the long-term plan, based on this VEWIN is required to draw its own plan for the medium term which needs to include intentions to alter expand water supply works, construct new works etc covering a period of at least 10 years. This plan needs to be approved by the VROM, but also can be opined upon by the Provinces. Water Companies are prohibited from modifying, extending or constructing new works in contradiction of the medium term plans. The Provincial Councils are required to draw plans for reorganisation of the public drinking water supply in their Provinces in so far as this promotes efficiency improvements.

6.4 CASE OF VITENS WATER COMPANY

In order to understand the way in which the Water Companies are implementing the Water Supply Act a case study was conducted at the Vitens Water Company. The WSA promotes the Provincial Councils to draw plans for reorganising public water supply to improve the efficiency of Water Companies. The Vitens case is interesting in this regard as they have recently concluded a merger in the year 2002.

6.4.1 Basics

The Vitens Water Company came into being in the year 2002 as a result of the merger between the following Water Companies: Nuon Water; serving the province of Friesland (NWF), Water Company Gelderland (WG); serving the province of Gelderland and Water Company Overijssel (WMO); serving the province of Overijssel. After the merger Vitens is the largest water company in the Netherlands serving a total of 4 Million inhabitants (Vitens, 2003). Basic data regarding the Vitens Water Company is listed in the Table 5.

Table 5 Vitens Water Company, Basic Data

Annual turnover	300,000,000 Euros
Connections	1,600,000
Distribution network	40,000 km
Treatment works	85
Water sales	260,000,000 m3
Consumers	4,000,000
Staff	1,200
Average consumption	125 litres/capita/day
Average water tariff	1.41 Euro/m3 (including VAT)

6.4.2 Market Segments

Vitens is active in the following markets:

1. Public Water Supply: 24 hour supply of potable water
2. Commercial: Delivery of tailor made water to companies, in cooperation with other parties
3. Water and Sanitation: Have a policy to pursue the integration of the water cycle, in order to be able to provide services in sewerage and sewage treatment also
4. International: Contribution to sustainable water management at global level by, offering some aid; and other forms of help like used equipment etc to Water Companies in developing nations, notably in Surinam and Mozambique. Also offer access to advanced water technology via Nuon.

6.4.3 Merger Issues

The most spectacular issue in the case of Vitens Water Company is the merger. During discussions with the officials of Vitens it was clarified that the merger had not taken place due to the threat of liberalisation. Neither was the merger because of the reason that by being a larger company there was a lesser chance of being swallowed. In fact the reasons quoted for the merger were the following:

1. Set a trend for other Water Companies
2. Achieve economies of scale and be cost effective

3. More of an internal drive

6.4.4 Effect of legislations on Vitens

From the Vitens case one observation that can be made is that the WSA has been successful in guaranteeing good quality water. So it can be said that the effect of the legislation in this case is in line with its objective.

At the moment it is not possible to compare the results of the performance of Vitens as a company with the constituent companies before they merged to estimate gain in efficiency. Nevertheless, Table 6 lists the performance of the individual companies before the merger.

Table 6 Perfromance details of NWF, WG and WMO

Water Company	Water quality index	Report grade for service	Environmental impact index	Total costs (€/connection)	Total Costs (€/m^3)
Average	97.2	7.6	25.0	205	1.28
NWF	98.0	7.5	20.8	196	1.23
WMO	99.5	7.8	28.8	199	1.27
WG	99.4	7.8	28.2	193	1.21

Source: VEWIN, 2001

It is evident that the individual Water Companies were performing better than the average in most cases. Only the environmental impact of the WMO and WG were higher than the average. This may be attributed to energy usage and desiccation caused by the abstraction of groundwater to prepare drinking water.

In any case there is less of a chance that the water quality index will suffer. Comparing results from 1997, improvements have been realised for the service grade and the environmental impact too, it is expected that this trend in improvement will be repeated. In the case of NWF service grade has suffered a bit due to the dissatisfaction over invoicing and WG for environmental impact (VEWIN, 2001).

6.5 CASE OF WATER COMPANY EUROPOORT (WBE)

The revision allowing the large customers to choose their suppliers is expected to be a part of the WSA by the end of 2004. In the light of this revision the WBE is a particularly interesting case. About 35% of the water produced by WBE is supplied to large customers (consuming more than 100,000 m^3/year) in the region.

6.5.1 Background

In the year 1975 only 2 of the 35 companies operating in the South Holland region were meeting the criteria of 100,000 connections laid down by the Central Government. The Provincial Government of South Holland therefore took several initiatives to reduce the number of Water Companies by voluntary acceptance. Even after 10 years of negotiations none of the Water Companies were acceptable to the plans of upscaling. That is when the Provincial Government decided to forcibly upscale the water supply sector in the region. In accordance with the WSA a reorganisation plan was drafted in 1985. Three new companies emerged out of this reorganisation plan and Water Supply Company of Rotterdam was charged with setting up a company for the

southern part of the province – Waterbedrijf (Water Company) Europoort (WBE) (Dane and Warner, 1999). Table 7 gives some basic information regarding Europoort as it exits today.

6.5.2 Industrial water supply

About 35% of the water produced is consumed by industries in the region of South Holland. There is a tendency for decrease in this clientele as increasingly the large customers are choosing to have their own supplies instead of relying on WBE or other companies for water supply. This has been possible as a result of technological innovations like the membrane technology that allows production of water of different qualities. This is an interesting fact as; the industrial water supply is viewed as a commercial business and not a public service as in the case of public water supply. Unfortunately for this very reason very little information is accessible. Nevertheless, some details that are known are reproduced here.

Water demand from the industries is for the following types of water:

1. Distilled water (6.7 million m3/year)
2. Tailor made water (depending on market)
3. On demand water (Confidential information)
4. Raw Water (Confidential information)

For this distilled water WBE has an internal network that serves about 15 industries. A separate company called Afvalverwerking Rijnmond has a supply contract with Europoort and takes care of production of distilled water. The network itself was built and is owned by Europoort.

Table 7 Water Company Europoort, Basic Data

Annual turnover	183,400,000 Euros
Connections	737635 (addresses)
Distribution network	6391 km
Treatment works	3 production plants
Water sales	137,000,000 m3
Consumers	Approx. 1500000
Staff	442
Average consumption	137 litres/capita/day
Average water tariff	1.00 Euros/m3

Supply of water to industries is arranged by way of individual contracts. Notable is the fact that the industries and other consumers like wise are charged on the basis of the quantity of water they are supplied with and on the type of water demanded. Table 8 below gives details of the charging system for water supply based on quantity.

Table 8 WBE water tariffs

Consumption	Yearly charges (Euros)	Rate (Euros/m3)
More than 300m3/year but less than 10,000m3/year	105.84	1.087
More than 10,000m3/year but less than 100,000m3/year	2,008.20	0.931
More than 100,000m3/year but less than 1,000,000m3/year	6,662.04	0.912
More than 1,000,000m3/year	103,382.88	0.843

6.5.3 Effect of legislations on WBE

WBE is not being largely affected by the proposed revision to the WSA whereby the large customers will be allowed to choose their supplier. WBE is not experiencing any serious threat from other Water Companies in the region. The evidence for this is that the number of industrial clients has neither gone up nor dwindled. That the length of the contracts that WBE has with its clients has also not shortened is corroborating this fact. As such the length of the contracts may depend on the investments required to service their needs, higher the investments longer the payback periods and hence longer the contracts.

6.6 EFFECTS OF LEGISLATION

The rationale behind the objective of the WSA is focussed more at protection of public health. Realising efficiencies while protecting public health is a secondary aim. The Public Water PLC mode of organisation is best suited in such cases. The reason being they do not exist to make profits but at the same time they are required to operate efficiently. In the case of the industrial water supply the proposed revision of the WSA is definitely offering the large customers more choice and also bringing about technological innovation, which is the primary aim of liberalisation.

From the case study of Vitens it is clear that the primary objective of the WSA is fulfilled. This primary objective of the WSA has been fulfilled in most cases for other Water Companies too. This, it is felt is the primary reason why there is no change required to the approach of the WSA in the present context and the sectoral set up.

The case of WBE has been able to dwell into the finer details of the issues surrounding industrial water supply like cost effectiveness and market oriented approach. This is due to the fact that the related information is commercial in nature and hence treated as confidential. But it does throw some light on the effect that the proposed revision is having on the sector already. It is very premature to speculate about how the revised WSA will affect the sector but the one thing that does emerge is the importance that the new technologies are playing in promoting competition. WBE is already facing some competition, not from other Water Companies, but from the industries themselves who may choose to have self-supply. This has been largely possible due to newer technologies, which allow companies to have different qualities of water thus helping to reduce costs.

6.7 OBSERVATIONS REGARDING THE WATER SUPPLY ACT

In answering the first research question regarding the evolution of the WSA it can be said that the Act has retained its legislative approach. It can be noted in the beginning of the section 6.2 that the evolution of the WSA is marked by the addition of prescriptive instruments that have reinstated its legislative approach from time to time. The much-debated “liberalisation for large customer” revision is still in discussion and is expected to be formally introduced in the WSA by the end of 2004.

Since there has been no evolution of the WSA from a legislative to an economic regulatory approach the need for answering the second question does not as such arise.

7 ENVIRONMENTAL MANAGEMENT ACT

7.1 ORIGIN

The predecessor to the Environmental Management Act (EMA) was the General Provisions for Environmental Protection Act (GPEPA) and was implemented in the year 1979. Prior to the GPEPA there existed five different acts taking care of different aspects of the environment. These acts were criticised by various sections of the society who alleged that the public participation and the appeal procedures were biased against them. The industry too claimed that the licensing procedures were far too time-consuming and companies claimed insufficient coordination between various authorities involved in licence issuing. The GPEPA was enacted to overcome these problems. The Act made several sectoral laws subject to uniform rules for application and granting of licences while providing for uniform participation and appeal procedures. Nevertheless it was felt that the act lacked coherence (Bressers and Plettenburg, 1995).

In 1993 the General Provisions for Environmental Protection Act was incorporated into a new Environmental Management Act. The act opened up the possibility of granting of integral environmental licences covering all environmental aspects. Licensing systems from five different laws namely the Air Pollution Act, the Chemical Waste Act, the Noise Pollution Act, the Nuisance Act and the Waste Materials Act were transferred to the EMA (Bressers and Plettenburg, 1995).

7.2 EVOLUTION OF THE ENVIRONMENTAL MANAGEMENT ACT

In the following paragraphs only changes relevant to water supply and wastewater sector in the EMA have been listed. Changes pertaining to the other aspects governed by the EMA like the household waste, air pollution and noise have not been listed for obvious reasons.

In the evolution of the EMA mostly the revisions have made changes to the existing provisions. The 2000 decree has added to the Act's legislative nature by conferring upon the local authorities powers to help combat cases of frequent ecological offences.

The following revisions were made to the Environmental Management Act in the year 1995 (FAO, 2004):

1. Section 4.24 concerning the Municipal Sewerage Plans was added. It concerned the directions, which the Provincial Authorities may give the Municipal Executive regarding the content and the deadline for the plan to be implemented.
2. Section 8.28 was also added in the same year, which concerned matters where a licence was required by any establishment under the PSWA and the application of the relevant sections of the EMA and the General Administrative Law Act.
3. Provisions of the Section 8.33 and 20.2 were modified. The section 8.33 concerns with licensing, particularly in cases where a licence is required under the PSWA and Section 20.2 concerns with provisions of appeal.

In the year 1998 two decrees concerning the EMA were issued (FAO, 2004):

1. Decree No. 655 of 1998 relative to environment reporting: This Decree concerns information in the form of documents that may be required by public authorities in order to evaluate the possibility to grant an environment permit for activities that may potentially harm the environment.
2. Environment Subsidies Decree (No. 720 of 1998): This Decree contains rules relative to rearrangement of framework of environment subsidies. It redefines requirements for obtaining of subsidies and prescribes certain conditions for projects to be eligible for

financing. Other provisions concern notification of aid to the Commission of the European Communities and obligations of the person receiving aid and procedures for the granting of subsidies.

In 2000 the Environmental Management Act was revised to amend the following sections (FAO, 2004):

1. Section 8.1 (concerning rules prohibiting the setting up of an establishment without a licence), section 8.13 (concerning regulations that a licence may be subject to, in the interest of environment protection), section 8.19 (concerning applicability of rules to parts of establishments and about modifications).
2. In the year 2000 Decree No. 320 relative to transactions for offences in the field of the environment was also implemented. The scope of the decree is to confer power upon (mainly local) authorities to propose transactions for simple and frequent ecological offences and thus to provide the authorities with an important instrument to enforce environment legislation. The main reason for transaction is to confront the offender as fast as possible with the consequences of the offending behaviour.

7.3 SYSTEMATIC ANALYSIS OF THE ENVIRONMENTAL MANAGEMENT ACT

7.3.1 Objectives

"Protection and improvement of the environment by ensuring effective waste (includes wastewater) disposal, economical use of energy and raw materials and limiting the adverse effects of the transportation of goods and people on the environment"

7.3.2 Rationale

By making it mandatory to have a licence to operate any establishment the Act hopes to cover all activities that are potentially pollution causing, further by attaching regulations to the licence it is intended to minimise or prevent pollution. Enforcement in form of monitoring helps to ensure compliance to the requirements as specified by the Act.

7.3.3 Actors of Implementation

VROM is the primary actor of implementation of the EMA. The Provinces are also involved where groundwater quality and abstraction is concerned. For the sewerage also the VROM is the main actor of implementation.

7.3.4 Target groups

The target groups, as far as the EMA is concerned, are the wastewater dischargers, Municipalities, the Water Companies and industries. For the issues related to groundwater the Water Companies are the main target group, other abstractors are also being targeted, though. Other target groups may be the industries producing wastewater.

7.3.5 Instruments

Prescriptive

1. Every once in 4 years the VROM and the Provinces are required to come up with an Environmental Policy Plan. Based on the requirements of the policy plans the VROM and the

Provinces are required to formulate an Environmental Policy Programme (Section 4.3 subsections 1,2,3&4, Section 4.7 subsections 1&2, Section 4.9 subsections 1&2 and Section 4.14 subsections 1&2). There is also a Municipal Environmental Policy Plan and a Municipal Environmental Policy Programme (Sections 4.16 and 4.17 and Section 4.20 subsection 2).

2. The Municipal Council also draws up a Municipal Sewerage Plan, which contains an overview of the facilities in the Municipality catering to collection and transportation of wastewater including the time when they may be due for replacement, how they will be operated, effect of such facilities on the environment and the results of the actions as proposed in the plan. The plan needs to be prepared in consultation with the Provincial Executive, the operators of the treatment installations to which the Municipality is connected, managers of the surface waters into which the water collected is discharged (Sections 4.22 and 4.23).
3. The Provincial Council lays down an Ordinance for the protection of environment, whereby it specifies the rules to protect groundwater quality with a view to water abstraction in the areas designated by the ordinance. In drawing the provincial ordinance the Provincial Council needs to take into account the current provincial environmental policy plan (Section 1.2 subsection 2c).
4. The provincial environmental ordinance may lay down rules necessary to protect groundwater quality in areas designated by the ordinance to protect groundwater quality and also prohibit activities of construction, operation or modification of establishments in those designated areas (Section 1.2 subsection 6a&6b).
5. Requirements in the interest of protecting the environment, regarding quality of the environment are laid down in an order in council (Section 5.1 subsection 1). The quality requirements may be based on either a standard value (quality that needs to be achieved and needs to be maintained more or less) or a limiting value (quality that needs to be met and once met needs to be maintained) (Section 5.1 subsection 3).
6. A licence is required to set up modify and operate any establishment (Section 8.1 subsection 1). In order to protect the environment a licence is subject to regulations, which may be aimed at determining the extent of adverse effects of the establishment on the environment, surveys and research may be carried out to estimate the effect on the environment and report them to the governing bodies and not to act in conflict with rules of the licence (Section 8.13 subsection 1). Any establishment, which needs to have a licence under the PSWA, needs to apply for the same along with the licence for the EMA or within 6 weeks of the application for the licence (Section 8.30 subsection 2).
7. The act stipulates that it is prohibited to discharge wastewater other then domestic wastewater, rainwater or wastewater that has properties similar to that of household wastewater into the sewer system (Section 10.15 subsections 1&2). VROM lays down rules for design, construction, modification and maintenance of facilities for collection and transport of wastewater (Section 10.16b).
8. The competent authority regularly monitors whether the establishments adhere to the restrictions and regulations of the licence, keeping in mind technological developments for protecting the environment (Section 8.22 subsection 1).

Incentives

1. In case of an establishment having a detrimental effect on the environment a licence can be withdrawn (Section 8.25 subsection 1a). Where a licence under the PSWA has been withdrawn, the licence under the EMA can also be withdrawn (Section 8.34 subsection 1).
2. The Provincial Council may levy a charge on groundwater abstraction to cover the costs made towards the provisions of the Provincial Environmental Ordinance. The levy shall be based on the amount of water abstracted and shall be paid by any person/establishment that abstracts groundwater other than to regulate water table or hydraulic head (Section 15.34).

3. Subsidies may be granted by the VROM for activities in the field of environmental management as designated by order in council. The subsidies are based on certain criteria, are valid for a certain period and have conditions under which the subsidies may be sought (Section 15.13 subsection 1).

7.4 CASE OF GW ROTTERDAM

In assessing how the EMA (portions relevant to sewerage) is implemented, a case study was conducted at the GW Rotterdam. This assessment it is based on the answers obtained to the following questions:

1. What is the institutional set up, which is responsible for serving sewerage services to Rotterdam?
2. What is the relation that they share with the Water Boards (this is particularly important as Water Boards are responsible for the treatment services which succeed the sewerage in the water chain)?
3. What are the characteristics of the system itself, how did it develop over the past?
4. How are the various activities of sewer management financed?
5. How is the sewerage sector affected by the legislations and regulation?
6. What does the future hold for the sewerage services in Rotterdam?

7.4.1 Institutional Set Up

Rotterdam is run by a city council and the Municipal Executive Committee, which comprises the Mayor and Aldermen. The city council of Rotterdam consists of 45 members. The city council is elected once every four years by the people of Rotterdam. The Rotterdam Municipal Authority employs around 18,000 people, a large proportion of whom work in Municipal departments that prepare and implement policy. These departments include:

1. The Rotterdam City Development Corporation (OBR): responsible for the physical and economic development of the city
2. The Rotterdam Municipal Port Management (GHR): responsible for the physical and economic development of the port
3. The Rotterdam Public Works Department (GW): acts as project manager and project developer for infrastructure projects
4. The Department for Urban Planning and Housing (dS+V): responsible for urban development in Rotterdam

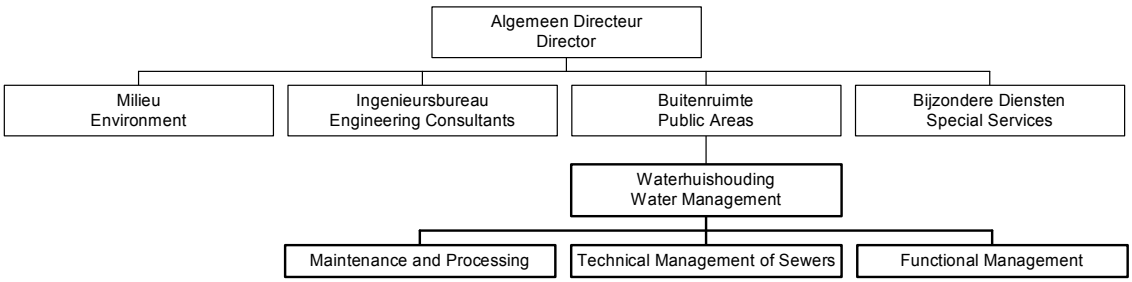
7.4.2 Gemeentewerken, The Public Works Department of Rotterdam (GW)

The Gemeentewerken or the Public works department of Rotterdam is a 2200 people strong organisation split into 4 departments namely: Engineering Consultants, Public Areas, Environment and Special Services. The Engineering Consultants manage projects from concept to construction and maintenance and even upgradation. The Public work engineers have been involved in the development of the city of Rotterdam since as early as 1850. They have been involved in activities including water supply (in the past) and drainage, the world's largest quay, the Metro system etc. The Public Areas department specialises in the maintenance of public facilities like roads, public parks sewerage etc. The Environment Operation is responsible for developing environmental plans and manages the implementation of the policies. The fourth department is the Special Services department (Gemeenteweken Rotterdam, No date).

7.4.3 Department of Water Management

The Department of Water Management falls under the Public Areas Department. It has three operational sections namely, Maintenance and Processing, Technical Management of Sewers and Functional Management. Together these sections are responsible for the sewerage system in Rotterdam city (Gemeentewerken Rotterdam, 2000). The Figure 4 shows the organisational set up of the Public Works Department of Rotterdam.

Figure 4 Organisational Setup of Public works department of Rotterdam



Source: Sewer department of GW Rotterdam

7.4.4 Cooperation with the Water Boards and Water Companies

The Water Boards responsible for treatment of the sewage generated in Rotterdam area are Water Board Delfland, Water Board Schieland and Treatment Authority, Zuiverinsschap Hollandse Eilanden en Waarden (ZHEW). There are three large treatment plants that serve the city of Rotterdam: the Kralingseveer, the Groote and the Dokhaven.

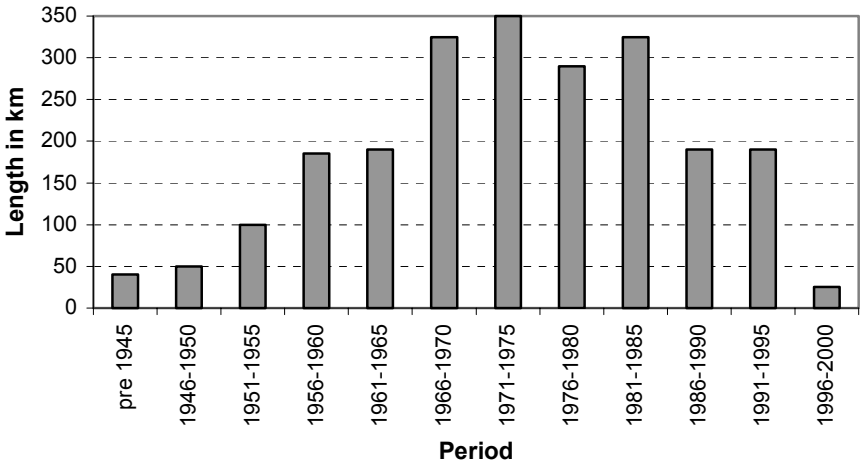
It may be noted here that there is a need for coordination and understanding between the GW and the Water Boards, particularly since these are different entities taking care of different but subsequent aspects of the water chain. Generally the Water Boards are able to specify a maximum flow that they will accept at a specified transfer point. In case of one of the treatment plants in the area, Hoogvliet, the maximum acceptable flow is $55m^3$/min. There are a number of agreements that the GW and the Water Boards have amongst them. One such agreement is; the initiatives to better manage the wastewater flow into the Dokhaven treatment plant. The idea is that an “even flow” enhances the treatment efficiency. In addition to the treatment of wastewater from Rotterdam, the Water Boards, along with the GW, are also responsible for water quantity management. In 2001 an agreement was made between the GW and the Water Boards, whereby the GW takes care of the smaller canals and water bodies and the Water Boards take care of the larger canals and water bodies. In addition the Water Boards also take responsibility for the level of water in the canals. Apparently there are not direct links with the Water Companies. There have been some cooperative moves in the past particularly when assessing the suitability of schemes for water supply. One such scheme was the provision of water of different qualities (drinking water and grey water, for flushing, washing etc). This scheme was abandoned, as it was not economical.

7.4.5 The Sewerage System

In the 19^{th} century the canals were being used in Rotterdam as a source of drinking water and also as a means of sewage disposal, this lead to many instances of Cholera particularly during 1848-1853. 1872 onwards there was a move to separate the sewage water from the polder water. Pump

stations were built to bring the sewage to the rive Meuse. Figure 5 shows the historical development of the sewerage system over the years.

Figure 5 Historical development of sewerage system in Rotterdam



The sewerage system of Rotterdam as it exists today can be summarised as in the Table 9 below.

Table 9 Details of existing sewerage system in Rotterdam

Population served	6,00,000
Registered sewer connections	296,480
Connectivity	99.8%
Collection network	2415km
Pump stations	350 (10m3/hr-90000m3/hr)
Combined sewer outfalls	217

Mainly three types of sewer systems are at present serving the city of Rotterdam: combined system, improved combined system and the separate system. During discussions with the GW it was made known that there are some instances of pressure systems and also some vacuum systems too. It has been a policy to construct separate sewer systems for newly built residential areas.

In spite of a highly commendable connectivity ratio of 99.8% the sewer system of Rotterdam is not without problems. During discussions with the GW, it was learnt that rather than exfiltration/leakage, infiltration is more of a problem these days. However this was not always the case, until 1985 there were problems with leakage in the sewer systems, but since then due to better connections the leakage figures have dropped.

7.4.6 Financing Sewer Management

In 90% of the Municipalities of the Netherlands, there exists a separate sewerage tax that is levied for financing sewer management activities, in the rest it is financed through general taxes. Sewer taxes are the main instruments of financing sewer management activities in Rotterdam. Sewer taxes finance as much as 85% of the capital requirements for sewer system extensions and also sewer renewals. For the rest of the 15% the department relies on fees charged for the services that they render to the port of Rotterdam. The Municipal Tax Department of Rotterdam Municipality

collects sewerage taxes, through a separate bill. Whenever there is a renewal planned, the capital requirements are financed through tariff raises. Since the year 2000 the sewerage charges have been raised steadily, in the year 2000 it was 198 Dutch Guilders, in the 2001 it was raised to 211 Dutch Guilders and the proposed tariff for 2005 is 229 Dutch Guilders.

7.4.7 Future Trends

The future holds a lot of challenges as envisaged by GW for the period 2006-2010. In response to the requirements of the Environmental Management Act the GW's Water management department is responsible for a water action plan and a sewer action plan. Currently sewer action plan for the years 2006-2010 is being studied, the main issues are:

1. Finishing the project to achieve 100% connectivity
2. Meet current water quality targets in the most cost efficient ways
3. What will be the sewer renewal targets based on the new criteria
4. Further water quality improvements at what price

7.4.8 Effect of Legislations

The relevant legislations for the sewerage component of the water chain are the EMA, the PSWA and the National Water Policy Plans. The objective of these plans for the sewerage component is to have a well functioning sewer system that can contribute to the reduction of water pollution and also to promote self-purification capacity of the streams in order to limit their degradation.

Changes to the Rotterdam sewerage that have been listed below are mostly resulting from the requirements of the PSWA and the National Water Policy Plans. The changes that the Rotterdam sewerage has undergone in the past are listed below.

1. Before the year 1980 the sewer system of Rotterdam was fashioned in a way that all the collected wastewater was pumped to the river Meuse at 3 different locations, without any treatment. After the PSWA was adopted all the untreated wastewater had to be treated before discharge into the Meuse. This required changes to the sewer system to redirect the sewage to the newly built treatment plants.

2. The fallout of the 1989 National Water Policy Plan was the concept of "basisinspanning" or basic effort, activated by VROM in 1992. In order to meet the requirements of this new concept an automatic control system was developed and implemented which would allow regulation of flows and control of dry weather flow from the sewer systems into the Dokhaven treatment plant.

3. Based on the requirements of the NW4 for 100% coverage and also separation of rainwater and wastewater, work is already underway. New settlements and residential blocks are nowadays being served by separate systems only.

From the case study at GW Rotterdam, it is clear that the EMA is responsible for regulating only certain aspects of sewerage like planning. Some rules for construction, modification and operation of the sewer systems are also been specified. From above it can be noticed that legislations and policy plans other than the EMA have a profound influence on the sewerage sector. While this may help in realising the objectives of the EMA, it does indicate the need for the EMA to address the issue of sewerage in a much more detailed manner. While this cannot be quoted as a shortcoming of the EMA there is certainly scope for improvement.

7.5 OBSERVATIONS REGARDING ENVIRONMENTAL MANAGEMENT ACT

In answering the first research question it may be stated that the EMA has not evolved from a legislative to an economic regulatory approach. Like noted in the beginning of section 7.2 only once instance of revision has added any policy instrument and even this policy instrument of a prescriptive nature. In effect the revisions have added to the legislative nature of the EMA.

Before answering the second research question it is important to note that EMA is an Act dealing with many aspects such as groundwater quality, sewerage and to the environment in general. The Act regulates the different aspects with different forms of instruments; groundwater is targeted by way of prescriptive and incentive based instruments, sewerage is regulated mostly by prescriptive instruments. For regulating the environment in general, prescriptive as well as incentive based instruments have been employed.

In answer to the second research question regarding reasons for change, a comparison between the objective of the EMA and the way the sewerage sector implements the Act has been made by way of the case study at GW Rotterdam.

8 POLLUTION OF SURFACE WATERS ACT

8.1 ORIGIN

Before the Pollution of Surface Waters Act (PSWA) came into being, there existed some local or regional regulations, dating back to the 17th century. These regulations provided some protection but were considered inadequate. During the 1960s some of the heavily polluting industries unintentionally set the agenda for the cleanup of the surface waters in the Netherlands due to the wide coverage in the media. In order to tackle the situation the PSWA was proposed in the year 1964, but was adopted only in the year 1969. The reason being that many government entities were lobbying to be the principal actor (Bressers and Lulofs, 2004). The Provinces were finally given these powers, who have then in most cases, delegated the task of wastewater treatment to the Water Boards. The National Government maintained the control over the state waters.

8.2 EVOLUTION OF THE POLLUTION OF SURFACE WATERS ACT

Below described is the evolution of the PSWA. During the evolution prescriptive as well as incentive based instruments have been added to the Act. Towards the later stages, in the years 2000, 2001 and 2002 the revisions have added incentive based instruments to the PSWA. It can therefore be said that the PSWA has evolved from a legislative to a more economic regulatory approach.

Under the provisions of the PSWA levies on wastewater discharges have been charged since 1971. The purpose of the charging was to raise revenue to finance measures necessary for abatement of pollution (Warmer and van Dokkum, 2003).

In 1981 the PSWA was revised to include provisions whereby, the V&W and the VROM were required to draw up periodic water quality plans for all state waters and the Provincial Councils for other watercourses. Also in the same year the Act empowered the relevant authorities to impose any relevant emission standards in order to implement international agreements, including EEC directives (Bennet, 1986).

In 1983 the Quality Objectives Decree laid down rules for the standards in order to implement the EEC directives for Surface Water for Drinking, Sampling Surface Water for Drinking, Standards for Freshwater Fish, Shellfish Waters and Bathing Water (Bennet, 1986).

In 1992 the Act was amended in regards to the applicability of the General Provisions for Environmental Protection Act when deciding upon the granting of permits and levies based on the newly introduced pollution standards (FAO, 2004).

In 1994 the section 19a of the act was revised. It concerns the national levies based on polluting standards. The amount of levy depends upon the type of pollution or polluting substance. The amounts are calculated either on the basis of "polluting units" or on the basis of a percentage of a levy so calculated (FAO, 2004).

In 1995 the section 7e was added to the Act to provide for powers of Provinces to give directions to municipal authorities with respect to permits (FAO, 2004).

In the year 1996, a Decree (140) was issued. This decree placed restrictions on the discharge of household and industrial wastewater and certain substances. It further stated that discharge of water from wastewater treatment plants could take place only if the plant had enough capacity and effective working of the plant can be guaranteed. As a rule it was forbidden to discharge the

substances remaining after treatment. Articles 4 to 7 of the decree provided for the measurement and control of treated effluents. It was possible for the Water Boards to attach conditions to permits granted for discharge of urban wastewater. This decree also implemented certain provisions of EC Council Directive 91/271/EEC (Urban Wastewater Treatment) (FAO, 2004).

In 1998 a Decree (84) was issued. This Decree concerns permits for discharge of polluting substances in surface waters, pollution charges, administrative arrangements and prescribes rules for the measurement, sampling, analysis and calculation of pollution. Further to this Decree another Decree stating amendments to the sections 13 and 23 relating to the measurement and analysis of discharge of wastewater so as to establish so-called "polluting values" of enterprises (FAO, 2004).

In 1999 a Decree (220) was issued. This Decree provides for an indication, which implies that, provisions of the PSWA and the WMA may be applicable to the waters connected to the principal State Waters. The principal waters and the indicated subsidiary waters thus form one entity for water management purposes. This indication was felt necessary because management of the subsidiary water separately from management of the main waters was considered ineffective (FAO, 2004).

In the year 2000, the chapter 4 of the PSWA concerning levies, contributions and charges has been replaced. The replaced chapter makes provision for charges and subsidies in relation with water pollution. Charges may be imposed by entities that are not a State body, in order to compensate for costs resulting form prevention of water pollution. The basis for the charge is the annual amount of discharged substances and its characteristics. Sections 20 to 22 provide for the calculation of the charge and section 23 provides for a charge for compensation of costs made by the State (FAO, 2004).

In 2001 a Decree was issued concerning the modification of several Decrees to implement the act 135 of 2000 relative to replacement of Chapter 4 of the present act. A note was issued as a part of the Decree explaining its provisions. The note brings out a key point in the application of the provisions of the act specifically with respect to the oxygen usage or BOD. It states that starting from 1st January 2001 the BOD measurements will be based on a yearly average as against a daily average value. This does not change the pollution levy that the polluters will have to pay (FAO, 2004).

In 2002 Chapter 2c was added to the PSWA. Section 15a of the stated chapter states that the Water Boards themselves can undertake the task of wastewater treatment or let a legal institution appointed by the Governing Board of the Water Board do the job. The task may only be sublet in case it is perceptible to be more efficient to do so (FAO, 2004).

8.3 SYSTEMATIC ANALYSIS OF THE POLLUTION OF SURFACE WATERS ACT

8.3.1 Objectives

“Combat and prevent pollution of surface waters”

8.3.2 Rationale

The PSWA has a two-pronged approach to combating pollution. By making it mandatory to have a licence for discharging polluting substances into the surface water it is effectively targeting the polluters themselves. Specifying limit values for polluting substances and specifying maximum concentration of the polluting substances in the surface waters helps in targeting the Water

Boards and other bodies responsible for treatment of wastewater. Since the charges for discharge of polluting substances is based on the amount of polluting substances discharged in the first place, this in fact acts as an incentive for the responsible entities to reduce the pollution as much as possible.

8.3.3 Actors of Implementation

The Water Boards share the responsibility for the quality of surface waters with the Department of Traffic and Water Management of the Ministry of Traffic Public Works and Water Management. The interesting fact here is that the Water Boards are the regulator as well as the regulated. The Water Boards require a permit from the Department of Traffic And Water Management when discharging into a watercourse under the jurisdiction of the Central Government, for any discharges into watercourses under their own jurisdiction, Water Boards needs to give themselves a permit (Bressers et al, 1992).

8.3.4 Target groups

Target groups for the PSWA can be categorised into two types, the primary polluters and the others are the Water Boards that are responsible for the quality of surface waters in the end.

8.3.5 Instruments

Prescriptive

1. It is prohibited to discharge waste, pollutants or noxious substances in any form into surface waters without a licence other than by means of an installation for that purpose. It is also prohibited to use an installation like mentioned above without a licence (Section subsections 1&2).
2. A limit value of substances, laid down by an order in council, specifies the maximum permissible concentration of substances or maximum permissible content per unit (for example in mg/L). It is prohibited to exceed these limiting values for substances that may cause pollution of surface waters. The limit values rules of measurement of polluting substances and dates for implementation shall be based on international agreements and regulations (EU directives), which are binding on the Netherlands (Section 1a subsections 1,2&3). It is prohibited to exceed these limit values (section 1b).
3. Specific requirements may be laid down for designated waters in order to protect special biotic communities or species (Section 1c).
4. Rules required to protect surface waters from pollution or to ensure efficient operation of the treatment installations may be laid down in an order in council (Section 2a subsection 1).
5. Revenue from the levies shall be used for; financing measures to control and prevent surface water pollution, pay levies imposed on responsible bodies by other bodies and to make payments towards costs of measures for control and prevention of surface water pollution (Section 23 subsection 1a, 1b&1c).
6. A body that has been charged with the responsibility of granting licences is also responsible for ensuring the enforcement of the provisions laid down, gathering information and dealing with complaints (Section 24).

Incentives

1. The Central Government or the Provinces or the Water Boards have full power to institute levies to defray the costs of measures to control and prevent pollution of surface waters. Levies are payable by those who deposit the polluting substances and are based on the

quantity or nature of the polluting substances discharged into the surface waters. In addition to the charges for polluting itself, additional charges may be sought for processing the applications for licences and licence amendments (Section 17 subsections 1,2,3&4).

2. These levies are based on quantity and nature of the polluting substance. For household the pollution value (in cases of BOD only) has been set at 1 population equivalent subjected to a maximum of 3.5 per dwelling (Section18 subsections 1&2).
3. If there is justification for doing so, the central government may make a contribution towards the cost of measures for pollution control and prevention of pollution of surface waters (Section 23 subsection 3).

8.4 CASE OF ZUIVERINGSSCHAP HOLLANDSE EILANDEN EN WAARDEN (ZHEW)

In assessing the effects of the legislations on the wastewater sector a study was conducted at the ZHEW's Sluisjedijk Sludge treatment facility. Within the facility, ZHEW has implemented the SHARON process in order to treat the High strength Ammonia wastes from the side streams. The SHARON is representative of a technological innovation resulting from the requirements of stricter legislations. The case study details some basic details of the ZHEW itself, the way in which the Nitrogen related legislations are implemented the technology itself and other developments of importance.

One of the responsibilities of ZHEW is to treat wastewater. The primary task that more or less depends on the wastewater treatment is to ensure clean surface waters in its area of jurisdiction. It is responsible for accepting the wastewater from the sewer systems of the connected Municipalities and conveying them to the 40 treatment plants and treating them to the required standards. All the treatment plants in the ZHEW jurisdiction together cater to a population equivalent of more than 1,6000,000. The ZHEW has a network of 350 km of pipes and operates 90 pump stations.

8.4.1 Background of Dokhaven and Sluisjedijk treatment facilities

Dokhaven has been treating wastewater since 1987. It receives wastewater (household and industrial) from parts of Central Rotterdam and Rotterdam West, Rotterdam South and Groot Ijsselmonde. Dokhaven treatment facility is completely underground; it is probably the only of its kind in the entire world and has a capacity of 470,000 population equivalents. The location where it is built, there used to be a dock surrounded by habitation and other commercial places. As a result of this, the area available for the treatment plant itself was very restricted. Due to this, the sludge handling facility had to be sited about 500 m away at Sluisjedijk, with intricate piping linking the two facilities conveying sludge supernatant flows and the polluted air from the ventilation system.

8.4.2 Nitrogen related legislations and their effects

The legislations for Nitrogen removal from the wastewater are applied differently to the existing and the new treatment plants. Until 1985 the then existing treatment facilities were removing Nitrogen with an efficiency of around 50% on a national average in the Netherlands. Then in 1985 it was decided that this had to be reduced by half, so to say the removal efficiencies had to reach 75%. The 75% removal did not apply to each individual treatment plant and was supposed to be achieved for each water board area or more generally at the national level. It is important to note that these measures were based on a yearly average of samples. The legislation was introduced in 1998.

For new treatment plants the limits for maximum allowable Nitrogen content in the effluent were set based on the following criteria:

- Plant serving a population up to 20,000 inhabitants, 15 mg/L
- Plant serving a population of greater than 20,000 inhabitants, 10 mg/L

The new EC Water Framework Directive has expanded the scope of water protection to all waters and has set a goal of achieving good status to all waters in Europe by the year 2015. In line with this objective it has included the objective of protecting all waters be it lakes, rivers, groundwater or coastal waters. The consequences of this for the treatment of urban wastewater, and for future demands on effluent characteristics is not clear and the moment. Following the present EC Directive, the entire region of the Netherlands was indicated as environmentally sensitive area and as a result some of the most stringent legislations (effluent characteristics) apply.

Looking at the unique situation that the Dokhaven and the Sluisjedijk plants are, the Department of Traffic and Water Management at the Central Government has allowed ZHEW time until 2006 to adhere with the requirements for the 75% Total Nitrogen removal in the ZHEW area, notwithstanding the fact that the new wastewater treatment plants in the area had to adhere to these requirements individually.

Increasing level of stringency in the legislations pose major challenges to the ZHEW, due to the special circumstances at Dokhaven. One such significant change was the requirement pertaining to Total Nitrogen in the treated wastewater, which is supposed to be tightened up in the year 2006. In its original form the plant was not designed to handle these new requirements, essentially signalling the need for a modification to the treatment plant. Since it first came online Dokhaven has been modified a number of times in order to realise efficiencies and on many occasions like stated earlier, stricter legislations.

8.4.3 Technological Innovation

In order to find a solution for the Total Nitrogen problem, help was sought from STOWA, the research association of the Water Boards. STOWA started to look at the various technological innovations that were available in 1994, which could help them treat the wastewater effectively and efficiently at the Dokhaven treatment plant. Some of the technologies evaluated include Magnesium Aluminium Phosphate (MAP), Stripping, Steam Stripping, Airlift Biological Reactor and Membrane Bioreactor (MBR).

Around the same time the Technical University of Delft was developing a process called SHARON (Single tank reactor for High activity Ammonia Removal over Nitrite). ZHEW was convinced adequately about the suitability and cost effectiveness of the SHARON process and therefore a full-scale plant of the lab scale SHARON process was developed at the Sluisjedijk sludge treatment facility in association with Technical University of Delft and Grontmij. Since, at the Dokhaven plant there was no space available, the SHARON process was sited at the Sluisjedijk. SHARON was required to specifically handle the high strength Nitrogen waste from the dewatering operations at Sluisjedijk. The flow from the Sluisjedijk is 1% of Dokhaven but contains 15% of Nitrogen when compared to the total Nitrogen coming into the Dokhaven plant and has a temperature over 30° C. Thus by separately treating this high strength waste at Sluisjedijk the overall effectiveness of the Dokhaven plant has been improved. The membrane bioreactor (MBR) was a good option for treating the side stream wastewaters from the sludge plant, and the effluent from the MBR would have been good for straight disposal into the receiving waters. The SHARON in the meanwhile is capable of removal rates of up to 90%. This as such does not cause any problems as the treated side stream is again returned to the start of the

wastewater treatment process at Dokhaven. The reason for choice of SHARON over the MBR is mainly an economical one.

The success of SHARON process has resulted in it being implemented in other locations out the Netherlands like New York in the USA. Within the Netherlands too, there are examples of other treatment units where SHARON has been implemented are at the wastewater treatment plant of Beverwijk, Zwolle and Utrecht (Utrecht is not a real SHARON process but is running over Nitrate). There is one instance of SHARON still in a planning stage at the wastewater treatment plant of Garmerwolde in Groningen.

In anticipation of the need for adherence to stricter standards and the unique situation of the Dokhaven plant, the ZHEW has already started to look for various methods that would optimise the existing plant and help perform better to meet any future requirements. These evaluations are still in an early stage but the following possibilities are being studied: MBBR system like Kaldness, an MBR, post denitrification with methanol addition and the USBF filtration process.

8.4.4 Other developments

The ZHEW will be merging with 4 other Water Boards, responsible for the task of water quantity management only, in the coming years. The decision to merge the ZHEW with the Water Boards is a political one. The government wishes to bring the tasks for water quality and water quantity together within one organisation. There are actually 6 water quantity management only Water Boards that are with in the jurisdiction of the ZHEW. It appeared to be difficult to merge with all 6 much smaller Water Boards within the region of the ZHEW and therefore in the end only 4 ('Brielse Dijkring', 'Goeree Overflakkee', 'de Groote Waard' and 'IJsselmonde') of the 6 merged with the ZHEW. The other 2 Water Boards ('Krimperwaard' and 'Alblasserwaard en Vijfheerenlanden') merged with other regions.

As such with the merger the ZHEW will be left with 23 treatment plants as against the exiting 40. This has serious repercussions on the organisations and also the way the ZHEW adheres to the legislations, since at 23 treatment plants the Dokhaven particularly has a lesser buffer to fall upon for meeting the 75% reduction in pollution requirement.

8.5 CASE OF WATER BOARD DELFLAND'S DBFO CONTRACT

The DBFO contract of the Water Board Delfland is the first of its kind in the Dutch water supply and wastewater sector. Detailed information of the contract was difficult to obtain as the official signing of the contract took place only on the 29th of January 2004. As per information available, the water board Delfland believes the scheme will provide efficiency gains of at least 10% (van Dijk and Schwartz, 2002).

Context of the contract is that the existing treatment plant at Den Haag no longer satisfies the standards for Nitrogen as set by either the EC or the Dutch legislations. According to the EC directives the Netherlands was required to satisfy these standards way back in 1998, but were allowed time until the year 2006 based on the evidence that plans were being formulated.

In 1999, Hoogheemraadshap van (Water Board) Delfland, put out an international call for tenders for a 30-year design, build, finance and operate contract for wastewater treatment plants in The Hague and its surrounding region in the Netherlands, representing a total revenue of around 1.5 Billion Euros. A consortium of firms called Delfluent won the contract. Major partners in Delfluent are Vivendi Water (a 40% shareholder in the project company) and two Dutch publicly owned Water Companies, Delta Water (20%) and Waterbedrijf Europoort (20%). Other members

of the consortium are Rabobank (10%) and two civil engineering companies, Heijmans Beton-En Waterbouw and Strukton, each with a 5% holding.

Delfluent will be responsible for upgrading the existing wastewater treatment plant at Houtrust and build a new plant at Harnaschpolder. The new Harnaschpolder plant will thus be the biggest facility in Europe capable of guaranteeing such a high level of environmental protection. Delfluent will also operate both plants and the domestic and industrial sewage systems for 30 years, serving 1.7 million people. Operation of the two plants and a 90 km sewage network will start at the end of 2003. Delfluent will also hire 45 Delfland employees (Waternunc, 2002).

8.6 EFFECTS OF LEGISLATION

Anticipation of increase in the level of stringency of the legislations have posed and continue to pose major challenges to the ZHEW and other authorities in charge of wastewater treatment. In the case of ZHEW this threat is more pronounced due to the special circumstances at Dokhaven. The SHARON is a result of the requirement pertaining to Total Nitrogen in the treated wastewater, which is supposed to be tightened up in the year 2006. In its original form the Dokhaven plant has not designed to handle these new requirements, essentially signalling the need for a modification to the treatment plant. Since it first came online Dokhaven has been modified a number of times in order to realise efficiencies and on many occasions like stated earlier, stricter legislations. The SHARON case, discussed at length above, is representative of technological innovation resulting from evolution of the PSWA. In the case of Water Board Delfland the provisions of the legislation has led to the first major PSP in the Dutch wastewater sector.

8.7 OBSERVATIONS REGARGING POLLUTION OF SURFACE WATERS ACT

In answering the first research question, it can be mentioned that the PSWA has evolved to embrace a more economic regulatory approach than the legislative approach. The very first revision that the PSWA underwent in the year 1971 added to its economic regulatory nature. Most of the revisions in the period between the 1980s and 1999 have added to the legislative nature. Revisions to the PSWA in 2000, 2001 and 2002 have reinstated its economic regulatory nature. It can thus be observed that the PSWA has been through a roller coaster of changes in approach. As it exists today the Act is based more on an economic regulatory approach rather than on the legislative approach.

In order to answer the second research question a comparison is made between the objectives of the PSWA and what has been realised by the sector so far. Since the time of its implementation the PSWA has achieved good results in almost all of Netherlands pertaining to point sources of pollution. What the PSWA has failed to do so far is to control the diffused sources of pollution like Nitrogen. Some of the later revisions like the 2001 and 2002 revisions may be attributed to the inability of the sector to implement requirements of the Act satisfactorily.

In implementing the legislations to control pollution due to Nitrogen the sector has been dragging its feet. In many cases there are plans to improve the existing treatment units to cater to the requirements but so far the results are less promising. At the ZHEW's falicity at Sluisjedijk too the problems related to effective treatment of the Nitrogen waste streams have led to technological innovations. However it is important to note here that in spite of the technological innovation the Sluisjedijk facility has not been completely successful in meeting the requirements of the PSWA.

9 DISCUSSIONS AND CONCLUSIONS

The primary aim of this research is to test the hypothesis in order to make out whether there is an evolution in the Dutch Water Supply and Wastewater sector from a legislative to a more economic regulatory approach. In line with this, answers were sought to the two research questions as spelt out in the section 2.4. This chapter on discussions and conclusions is a culmination of the analysis performed and laid out in the chapters 4 through 8.

9.1 HYPOTHESIS REVISITED

In the background section (section 2.1), a relation has been made out between the historical development of the water supply and wastewater sector in the Netherlands, the happenings at the EU level and the their effects on the sector. Based on these background studies the hypothesis has been developed. The hypothesis that is being tested in this research reads as:

"The water supply and wastewater sector in the Netherlands is evolving from a legislative approach to a more economic regulatory approach".

This section gives a better understanding about the interrelationships between the research questions and the findings. The results of the systematic analyses are presented (partially) in the Table 12 on the page 51 of this document. The observations made in relevant sections of the Acts analysed in this research have been consolidated and reproduced here for ease of reading.

1. For the GWA a combined approach has been adopted since the very beginning. This has not been able to ensure that the objectives are realised. Additional charges (instance of incentive instrument) have been applied as a part of the environmental tax on groundwater abstraction. Importantly this has not been added as a taxation instrument to the GWA and is regulated by the Central Government. This has helped lessen the gap between the surface water produced and groundwater-produced drinking waters, but has so far failed to create a positive impact. The underlying reason for this may be the fact that the charges are relatively low and smaller abstractions are even exempt from charges and taxes.

2. The WMA has not changed its approach since the time it has been implemented. The interesting revision has come in 1999. This reinforces the need for cooperation between the various actors involved in management of water in the Netherlands. In doing this, the Decree is strengthening the Act and thus improving the chances of realising the objectives.

3. The WSA is focussed more at protection of public health. Realising efficiencies while protecting public health is a secondary aim. This is not the case for industrial water supply, which operates more on a commercial basis. The proposed revision of the WSA (due in 2004) is definitely offering the large customers more choice and also bringing about technological innovation, which is the primary aim of liberalisation. As such this does represent an evolution towards an economic regulatory approach, while still protecting the public interest. For the public water supply too the VEWIN benchmark does represent quasi competition. The benefit of these benchmark studies, though, is difficult to isolate and quantify.

4. In the case of GW Rotterdam the objectives for the sewerage sub sector have been satisfactorily achieved. The one problem that is evident here is that is it difficult to tell apart the effect of the EMA and other legislations. In the case of GW Rotterdam, the impression that one gets is that the influence of the National Water Policies and the PSWA is more on the sewerage sector than the EMA. The EMA is responsible for regulating only certain aspects of

sewerage like planning; some rules for construction, modification and operation of the sewer systems are also been specified.

5. Of all the Acts analysed in the research only the PSWA has evolved towards a more economic regulatory approach. The PSWA has achieved good results in almost all of the Netherlands pertaining to the point sources of pollution, but has failed so far, to control the diffused sources of pollution like Nitrogen, pesticides and other micro-pollutants. Some of the later revisions like the ones in 2000, 2001 and 2002 may be attributed to the inability of the sector to implement the requirements of the Act satisfactorily.

Important results that contribute directly help in answering the research questions have been noted below. The following inferences can be drawn based on the observations were made in the sections 4.4, 5.4, 6.7, 7.5 and 8.6:

1. The GWA had a predominantly legislative approach right from the beginning and did not evolve towards a more economic regulatory approach.
2. The WMA too had a predominantly legislative approach and did not evolve towards a more economic regulatory approach.
3. The WSA has been regulated with a legislative approach right from the beginning and continues to do so with no evolution towards a more economic regulatory approach.
4. The EMA had a combined approach and has not evolved towards a more economic regulatory approach.
5. The PSWA had a combined approach but has evolved towards a more economic regulatory approach.

In answer to the first research question it can be stated that in the case of Dutch water supply and wastewater sector not all the legislations examined in this research are evolving from a predominantly legislative approach to a more economic regulatory approach. Except for the PSWA none of the other acts show a trend of evolution towards a more economic regulatory approach.

The second research question regarding the reasons for the evolution is relevant only in the case of the PSWA. The PSWA has achieved good results in almost all of Netherlands pertaining to point sources of pollution, but has failed so far, to control the diffused sources of pollution like Nitrogen. Some of the later revisions like the one in 2000, 2001 and 2002 (which add to the economic regulatory character) may be attributed to the inability of the sector to implement requirements of the Act satisfactorily. Some proof of this can be found in the case studies itself. The case of SHARON at ZHEW does come up as a good example of technological innovation to help meet requirements of the PSWA. However the fact still remains that the plant is incapable of meeting the requirements satisfactorily as of now. How well this evolution in approach may help the cause of the Act still remains to be seen. In the past the Act has been successful in achieving spectacular results.

9.2 CONCLUSIONS

Based on the observations the following conclusions can be made:

1. In the case of the Dutch water supply and wastewater sector not all the legislations examined here are evolving from a predominantly legislative approach to a more economic regulatory approach. Except for the PSWA none of the other acts show a trend of evolution towards a more economic regulatory approach.
2. Each of the acts shows a different trend of evolution.

3. Evolution of each of the legislations has been directed by the policy objectives towards each of the sub sectors.
4. Application of either the (predominantly) legislative or the (more) economic regulatory approach to two different sub sectors may yield different results.
5. Sub sectors regulated by legislations based on economic regulatory approach have been more progressive in terms of technological innovation, private sector participation and liberalisation.

9.3 LIMITATIONS OF THIS RESEARCH

One of the inherent limitations of this research is that the study is focussing only on the Netherlands. Since this study was done under the broader realm of the EUROMARKET project the focus is on the evolution towards an economic regulatory approach. The reasons for non-evolution towards an economic regulatory approach are not pursued. Further, it is studying only the most relevant Acts that that regulate the water supply and wastewater sector have been analysed such as the GWA, the WMA, the WSA, the EMA and the PSWA. Other Acts, which might have some influence on the sector for example the Soil Protection Act, General Administrative Act, Water Boards Act etc, have not been studied. It is assumed here that the dominant force in causing the evolution of legislations is the shortcomings of the sector to effectively implement the requirements of the legislations.

It is not the intention of this research to advocate either the legislative or the economic regulatory approach. Both the approaches have their own advantages and disadvantages, which have been listed in Table 10 and Table 11. It is important to realise is that the choice or the type of approach to be adopted depends on many factors. A discussion in this regard is out of the scope of this research.

Table 10 Advantages and disadvantages of the legislative (Standards based) approach

Advantages	Disadvantages
1. More widely understood form of environmental policy 2. A pragmatic approach when the effects of pollution on the environment are uncertain 3. Political costs of standards are lower compared to market based (economic) instruments such as taxes and subsidies	1. An 'optimum' standard is difficult to determine, especially with non-marketable goods, such as water 2. No incentives to exceed the set standard 3. Penalties for violating standards tend to be too low and enforcement tends to be weak 4. To be effective, standards need to be revised frequently 5. Very stringent standards may induce political costs as businesses may be adversely affected 6. The financial costs of Standards may be high

Source: ESCAP, 2001

Table 11 Advantages and disadvantages of Economic regulatory approach

Advantages	Disadvantages
1. Charges act as economic incentives to save (water), reduce (pollution). 2. Charges allow firms to adopt a economically feasible solution	1. Firms generally pass on a portion of the charges on them on to their customers 2. Monitoring costs can be high when the charges are based on emission. 3. In case entry is unrestricted, subsidies cause more entrants and therefore more pollution

Source: ESCAP, 2001

The evolution of water supply and wastewater services in the Netherlands has been exemplary. Water supply and wastewater services have come a long way from the earlier ideas to protect man against water to protecting water against activities of man. These developments have not been without consequences for the ways in which the water supply and wastewater sector is regulated. In this research focus has been on the evolution of the legislations and regulations. Prior knowledge of the evolution pattern of the legislations, it is believed will help in understanding and studying the effects they may have on the sector in greater detail.

9.4 SCOPE FOR FURTHER RESEARCH

The focus of the current research is more on the evolution of the legislations. An important aspect that it does not dwell upon, in detail, is the study of the impact of the evolution of the legislations on the sector. In the current scenario, where the EC has been promoting competition and market based economies, such an analysis would prove to me very useful. Further research catering to this aspect can be carried out with the results of this research as a foundation. What will be required for such a study is a detailed analysis of the impact the legislations are having on the sector. Very interesting would be the study of the effects different (legislative or economic regulatory) approaches have on the sector.

Table 12 Overview of Acts, responsible authorities, targeted group(s), objectives and rationale

Name of the Act	Actors of Implementation	Targeted group(s)	Objectives	Rationale	Regulation by
Groundwater Act	Provinces	Water abstractors/ Water companies	"To foster proper management of groundwater through rules laid down for abstraction of groundwater and infiltration of groundwater"	Licensing to manage groundwater resources and charging to encourage surface water resources for preparing drinking water	A combined legislative and economic regulatory approach
Water Management Act	V&W (State waters)	Water abstractors/ Water companies	"…Coherence and efficiency of policy and administration in respect of water management as a whole and quantitative control of surface waters."	A coherent and efficient policy towards water management will promote sustainable use of water resources.	A combined legislative and economic regulatory approach
	Provinces/Water boards (Other waters)				
Water Supply Act	Drinking Water company	Water companies	"Contribute to the improvement of public health by providing safe and sustainable drinking water services"	Public health is protected and improves when wholesome drinking water at required pressures is provided.	Predominantly legislative approach based
	VROM (Standards for drinking water)				
	VROM/Provinces				
Environmental Management Act	VROM, Provinces (Groundwater and other waters)	Provinces and Industries	"Protection and improvement of the environment by ensuring effective waste (includes wastewater) disposal, economical use of energy and raw materials and limiting the adverse effects of the transportation of goods and people on the environment"	Mandatory licensing for all establishments to capture all possible causes of pollution, enforcement by monitoring to help ensure compliance	A combined legislative and economic regulatory approach. For sewerage legislative approach
	Municipalities (Household wastewater & rainwater)	Municipalities			
Pollution of Surface Waters Act	V&W (State waters)	Polluters/ Wastewater dischargers	"Combat and prevent pollution of surface waters"	Effectively target polluters by mandatory licensing and provide incentives for polluting less by charging based on quantity of pollutants discharged.	Predominantly economic regulatory approach. Still retains some legislative approach
	Provinces/Water boards (Other waters)				
	Provinces/Water boards (Specific industrial sectors)	Municipality (sewerage) Water boards (wastewater treatment)			
	Municipality	Municipality			

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