

# Groundwater protection in Denmark and the role of water supply companies

Jacob Dyrby Petersen and Lisbeth Flindt Jørgensen

Denmark has a decentralised water supply structure with about 2500 water supply companies. Until recently, about 150 of these, especially the larger ones, were owned by local authorities; the rest are private, all run on an independent and not-for-profit basis. Recently, a new law, the Water Sector Law (Miljøministeriet 2009), was implemented. Its purpose is to privatise the water supply sector (although, as hitherto, into not-for-profit corporations), and statutory duties are separated from operations in order to make the supply of drinking water to consumers as efficient as possible. An important element of the Water Sector Law is the introduction of a new regulatory body, the Utility Secretariat. The role of this new institution under the Danish Competition and Consumer Authority is to enforce price ceilings on drinking water, based on a selection of benchmark parameters.

Danish policy is to base the drinking water supply on unpolluted groundwater. Nevertheless, in 2010, pesticides were detected in 25% of all tested, active abstraction wells, and the level for individual substances was exceeded in 4.5% of the wells (Thorling *et al.* 2011), a situation more or less unchanged over the last 20 years. This calls for further and continuous measures to strengthen groundwater protection. In addition, the range of protective activities implemented over the last decades may require reinforcement as groundwater monitoring data show that a high proportion of young

groundwater is polluted with pesticides (Thorling *et al.* 2011).

Our hypothesis is that during the last decades groundwater protection has changed from being a national responsibility to becoming a more locally embedded task. We also see a change towards the water supply companies being the major actors capable of initiating active groundwater protection. This transition also implies a change as regards economy, viz. from public authorities to consumers. The aim of this paper is to discuss how the Water Sector Law affects the frames for groundwater protection when an increasing part of the effort hinges on the water supply initiative taken by private companies.

## Background

Denmark is one of the countries in the world most heavily reliant on groundwater as more than 99% of all water supplies are derived from this source (Jørgensen & Stockmarr 2009). Thus Denmark has a strong incentive to, and tradition for, knowledge-based groundwater management. The characteristics of the Danish hydrogeological conditions, combined with wide-ranging groundwater monitoring and a relatively advanced technological and administrative approach as well as a tradition for public involvement in administration, have shaped the present framework of groundwater protection in Denmark.

In Denmark, official groundwater protection began in the 1970s with the creation of the Ministry of the Environment. The ensuing environmental legislation and the establishment of 14 regional authorities prepared the path for regional groundwater management strategies based on national legislation for the protection of the environment, including groundwater. As a consequence of a statutory framework reform in 2007, abolishing the 14 regional authorities, groundwater protection was transferred to the 98 municipalities (kommuner).

Initially, mainly prospective activities were addressed, but a few years later remediation acts were enforced and resources allocated to manage the 'sins of the past' in terms of old polluted sites. Water supply and water demand manage-



A modern Danish waterwork from Østerby, eastern Jylland.

Table 1. The interviewed institutions

Interviewed institution	Representing
Two large, urban water supply companies	Water supply
Two water supply associations	Professional body
One agricultural association	Professional body
Two municipalities (kommuner)	Public sector (local)
The Nature Agency (Ministry of the Environment)	Public sector (national)
The Utility Secretariat (Danish Competition and Consumer Authority)*	Public sector
One large, private contractor/consultant	Private sector

\*The authority implementing the Water Sector Law

ment strategies emerged, e.g. by launching saving campaigns targeted at both industrial and private consumers. Appeals soon followed not to use pesticides in private gardens etc. to reduce groundwater contamination. These public campaigns were initiated and implemented by the state as well as the water supply companies. The latter were allowed a more operational role in groundwater protection by a change of the Water Act in 1999, financing activities through water levies (Miljøministeriet 1999). Thus groundwater protection was no longer solely dependent on initiatives by the state.

## Methods

To analyse the past and present status of involvement in groundwater protection and to examine what is conceived as the overriding issues of the new Water Sector Law, two major sources are used: (1) a survey conducted in 2010 among the 75 largest Danish water supply companies (Pedersen 2010a) and (2) qualitative interviews in 2011 with key persons in the water sector (Table 1), combined with a concurrent study of the political and legislative process surrounding the implications of the water sector reform (Petersen 2011). Given the dynamic nature of the field of study, the interviews were conducted within a period of six months with follow-ups carried out as semi-structured interviews based on an iterative and adaptive approach (Kvale 1997). The interviews covered the views of informants on:

- the historical development of the water supply sector;
- the interplay between the authorities and the water supply companies;
- the efforts and players in the Danish groundwater protection regime and
- the legislative process and the implications for the economic and ecological aspects of future groundwater protection.

The theoretical frame was partly based on a theoretical network analysis adapted from Sørensen & Torfing (2005) and partly on a meta-analysis of the understanding of groundwater management from the definition of Market Environ-

mentalism (Bakker 2005). The network approach was used to analyse the use of decision making and coordinating networks between actors instead of the two traditional management instruments: hierarchy (i.e. state control) and free market. This enables an assessment of how the Water Sector Law has changed the opportunities of the water supply sector to form and co-operate within networks.

Market environmentalism can be used as a theoretical tool to analyse the development of resource understanding and resource management based on market mechanisms, based on studies from the UK. From being a supply-led, state-owned and managed resource, groundwater in the UK is increasingly governed through the private sector and market-based instruments. As a country of comparison, the theoretical framework is used to analyse the development in Denmark.

## Results

In 2010, 48% of the 75 largest Danish water supply companies were actively involved in groundwater protection activities, and were partly financing these (Pedersen 2010a). The companies reported that they had used between 1 and 25% of their annual turnover on groundwater protection (Pedersen 2010b). Although these estimates are highly uncertain, water supply companies have reported increasing expenditure on these protection activities (Fig. 1), and the figures indicate

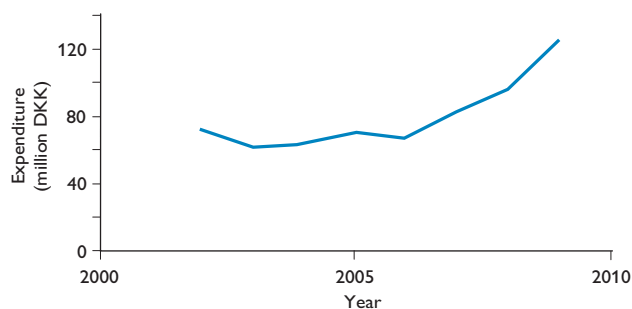
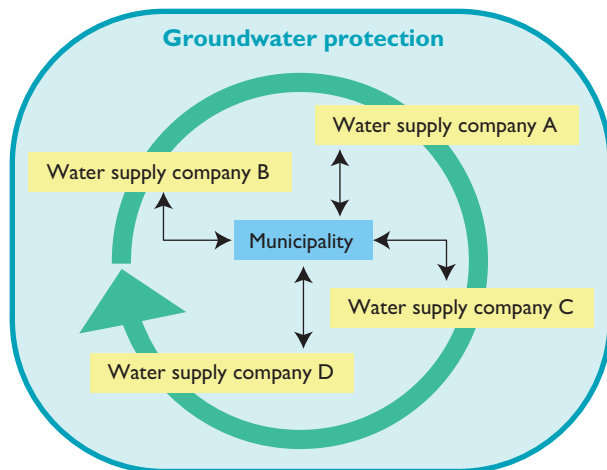


Fig. 1. Expenditure related to groundwater protective activities as reported by the water supply companies. Modified from Petersen (2011).

### Before Water Sector Law



### After Water Sector Law

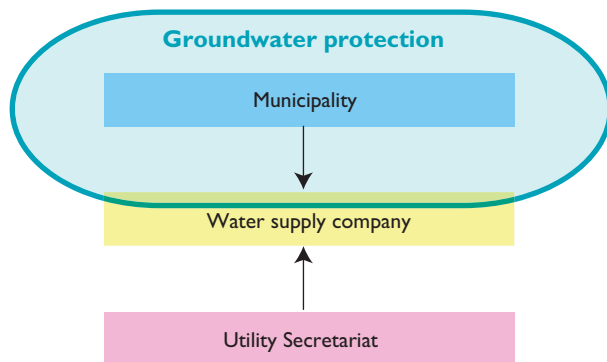


Fig. 2. The framework for groundwater protection before and after the implementation of the Water Sector Law. The networking is expected to decrease, and the water supply companies will change from being both operators, planners and decision makers to be operators only.

a total annual funding from the water supply sector of more than 100 million Danish kroner (Petersen 2011). More than half of the interviewed water supply companies expected expenditure to increase or at least remain at the same level in forthcoming years, and more than 60% expected necessary future activities (Pedersen 2010b).

The interviews conducted by Petersen (2011) reflect that the water supply companies have taken care of a range of different tasks connected with groundwater protection. They have often voluntarily entered networks (see Fig. 2) with each other and the relevant municipalities and thereby broadened the character of tasks to a degree that would otherwise have been impossible, based on individual water supply company economy and human resources. The tasks cover afforestation, volunteer farming agreements with landowners, groundwater resource and quality investigations, entry into

action plans together with other water suppliers, stakeholders and local authorities, etc. These tasks were previously financed by adding an extra consumer levy on the water price, typically a groundwater protection tariff of less than 2% of the total water price per cubic metre. As a consequence of the Water Sector Law, the water supply companies fear that this will not be possible in the future as the law allows the Utility Secretariat to establish differentiated price ceilings for the individual water supply companies (Petersen 2011) based solely on production expenditure.

One of the two water supply organisations have expressed their concerns at this new development, expecting that the water supply companies will have to focus their activities only on economic issues and not, as previously, be able to perform groundwater protective activities for long-term consumer benefit (Petersen 2011).

The interviews revealed concerns regarding the capability of local authorities to set up groundwater protective activities at the same level as the former regional authorities, due to limited resources under the new statutory framework. These concerns are related to both spatial (arm's length) aspects (the water resource being managed at a local and not a regional level, giving local interests larger influence) and resource issues (the local authorities lacking possibilities of sustaining both economy and skills; Petersen 2011). Furthermore, there is fear among water associations that the local authorities will only have an active role in protecting the groundwater in quantitative terms, as qualitative aspects are now to be handled in national legislation and action plans, and not at a local level. Thus the municipalities may only be in a position to administer and outline the overall framework, and only perform limited actual groundwater protective activities. Accordingly, the interviewed municipalities expressed their expectations that the water supply companies are to be *the* active players in these activities, and that the economic resources are to be found through water levies (Petersen 2011). The capacities of the water supply companies should therefore include the practical implementation of future groundwater protection measures, at least as seen from the municipalities' point of view.

## Discussion

Over the past two decades, the water supply companies have entered into different *networks*. These networks have been established for various reasons, which could be an experience of missing coordination in societal management, or a need for mutual action and sharing of knowledge and resources (Sørensen & Torfing 2005). The networks have been associated especially with groundwater protective activities such

as afforestation, voluntary agreements with landowners on non-pesticide cultivation, investigations and action plans (Petersen 2011).

How does the new Water Sector Law influence these networks and their associated activities? The law sets strict limits on how the water supply companies can use their financial resources. The first few trials have already shown that the Water Sector Law does not provide the framework necessary for continuation of former activities such as afforestation and networking, as the financial platform in terms of a water tax is not in accordance with the law. Both the water supply companies and the local authorities look upon this as a bottleneck in establishing and continuing effective groundwater protection (Petersen 2011).

The intension behind the Water Sector Law is to ensure economically efficient company operations and at the same time the law emphasises that the main objective of the companies is to abstract, treat and distribute drinking water (Petersen 2011). On the other hand, a central element is that the water supply companies are allowed – if not obliged – to perform groundwater protective activities if required by the local authorities as part of a public environmental action plan, dictated by the central authorities.

As the interviews revealed, the experience and financial capacity of the decentralised water supply companies have played an essential role in the protection of the Danish groundwater over the past decades, and there is considerable concern regarding the future fate of these activities (Petersen 2011).

The new regulatory paradigm is by Bakker (2005) described as Market Environmentalism, where market mechanisms are to ensure efficiency, competition and sustainability. Whereas the business aspects are beyond the scope of this paper, the environmental perspective implies a movement towards a capitalisation of the environment to include resource protection in water pricing, as attempted in the UK. From a quantitative perspective, the price can reflect most of the cost related to abstraction and distribution. Qualitative groundwater protection, however, has entrenched complexities. Due to the intertemporal aspect and imperfect, although ever increasing knowledge, the financing of qualitative protection may shift during the coming years as the water supply companies are encouraged to focus more narrowly on initiatives directly related to their resource.

Our study shows that combined with the recent structural reforms of the environmental management authorities, the Water Sector Law sets the stage for a shift in a formerly accepted managerial practice. This is mainly seen as a drawback as it reduces the possibilities of the water supply companies to undertake groundwater protective actions that are seen as necessary by the individual companies and leaves them in a role where they are only operators of actions dictated by the municipality. The benefits may, on the other hand, be a better coordinated and integrated water management policy, where the groundwater protection is seen in a more holistic approach that also calls for actions in areas where the water supply companies have not so far been active. However, this calls for a strong incorporated and active integrating governance strategy from the local authorities. Only the future can show how this will come out.

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### Authors' addresses

J.D.P., Roskilde University, Department of Technological and Socio-Economic Planning, Universitetsvej 1, DK-4000 Roskilde, Denmark.

E-mail: [dyrby@ruc.dk](mailto:dyrby@ruc.dk)

L.F.J., Geological Survey of Denmark and Greenland, Øster Voldgade 10, DK-1350 Copenhagen K, Denmark.