The German Experience with a self-organised Water Sector – Key Factors for an Alternative to Regulation

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Abstract: The German water sector is characterized by a multiplicity of operators with versatile operating models and - in the absence of strict regulatory requirements - a high degree of self-organization. Drinking water quality and wastewater effluent standards are subject to quality regulation according to German law, in accordance with the respective European standards. Main target of this paper is to present the status quo of the water market in Germany and to discuss advantages and disadvantages associated with the lack of explicit economic regulation. Consequently, legal framework, sectoral structure and level of competition as well as the sectors economic challenges will be in the focus. The paper represents primarily parts from former results of the European research project "TRUST – Transitions to the Urban Water Services of Tomorrow". In this context *Hoffjan and Müller (2012)* investigated the contemporary market structure and regulatory framework of four European countries (Scotland, Portugal, Norway and Germany). Over and above these general findings, *Hoffjan, Müller and Reksten (2014)* have considered competition models and efficiency potentials across Europe, of which some experiences of German water benchmark activities will particularly be presented.[1]

Keywords: German Water Sector, Regulation, Self-Organisation, Benchmarking, Water Pricing

Introduction

In Germany, the water supply and wastewater removal sector can be characterised with high performance, quality orientation and reliability for the customer. Further, the technical conditions of the systems as well as environmental and hygienic standards are at a high level (see Libbe (2014): 1), the drinking water quality and the reliability of supply (quantity, location, time) are excellent (see Bundesministerium für Gesundheit (2011): 2, Umweltbundesamt (2010): 72). The greatest challenge is to maintain these quality levels with limited resources. Therefore, discussions among the sectors' stakeholders focus more and more on economic performance. The aim of this paper is to present to what extent the German challenges can be met under a sectoral structure that is primarily based on self-organisation.

General Characteristics

Compared to many other European countries, Germany is fortunate to have plenty of water resources. Beside of many natural lakes, rivers and well-fed groundwater systems in large areas, Germany has numerous artificial lakes and reservoirs. Only 2.7 % of the available water resources are used for public water supply, which indicates extensive water reserves (see Statistisches Bundesamt (2011): 20-25; Umweltbundesamt (2010): 14-18)). Further, the impacts of climate change are likely to be moderate. Nonetheless, the long-term planning and investment periods in the sector make forecasts and adaptations to the consequences of climate change necessary (see DVGW (2009): 2). Beside of precipitation during all seasons, the German climate is characterized by moderate temperatures and frequent weather change (see Statistisches Bundesamt (2011): 20). The German Weather Service generally predicts sufficient future rainfall, whilst temperature forecasts based on different climate scenarios consistently indicate increasing temperatures (see Deutscher Wetterdienst (2014a) and (2014b)). It can be summarized that "across Germany, annual average temperatures will go up, resulting in warmer and drier summers and milder and wetter winters" (DVGW (2009): 2).

Apart from climate change, Germany will also be affected by demographical change. Whilst the population was around 82 million in 2008, future forecasts show an estimated decrease of around 4.6 million people until 2030 (see Statistische Ämter des Bundes und der Länder (2011): 21). Especially for sectors with rigid assets and capacities like the water industry, strongly declining consumer numbers are alarming. Moreover, the aging

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population becomes more and more challenging for the wastewater treatment because of drug residues in the wastewater (see BDEW et al. (2011): 41).

Legal Framework

The primary source of law for water supply and wastewater removal in Germany is the Water Resources Act (Wasserhaushaltsgesetz - WHG) of 2009. This law makes requirements concerning the management of all water resources: surface water, ground water and marine water. Furthermore, the WHG includes regulations concerning flood protection, water body development, water supervision and fines. In addition to these themes, the law also deals with specific regulations concerning the water supply and wastewater removal, of which the most important issues are presented in the following (see WHG (2009)).

Sewage shall be removed reasonable, so that public welfare is not compromised. Further, the legal entities of public law, which are required under state law, are responsible for the wastewater removal. However, the liable entities are allowed to transfer the wastewater obligations to third parties. Anyone who operates a sewage system is required to maintain its state, its ability to function and its conservation. Moreover, the service provider has to monitor its operation and the type and quantity of sewage content himself. The entity has the obligation to record and store the relevant information and upon request to provide them to the competent authority (see WHG (2009): § 54 – 61). Since 2009, water supply is *officially* a service of general interest (Daseinsvorsorge), which emphasizes its great importance and essentiality. The whole population depends on an adequate water supply. For this reason the water suppliers are forced by the requirements of the WHG to manage the resource water carefully and to inform the end-consumer on water saving opportunities. Further, the water demand shall be covered primarily by local, close water resources, if the effort is reasonable and acceptable (see WHG (2009): § 50). Thereby no region shall be affected disproportionately to serve an area-wide water conservation (see Lotze/Reinhardt (2009): 3277).

The hygienic requirements for the provided drinking water are regulated by the German drinking water regulation (Trinkwasserverordnung) based on the EU Drinking Water Directive (see The Council of the European Union (1998)). The water quality regulations are controlled by the local health authority and reported to the German central government and to the EU commission. In case of inadequate drinking water quality, the local health authority initiates further action. Optionally, fines will be imposed or even the interruption of supply will be arranged (see Trinkwasserverordnung (2001): § 9, 18, 24). Analogously, all requirements concerning wastewater are embedded in the wastewater regulations (see Abwasserverordnung (1997)), based on the European Wastewater Directive (see The Council of the European Communities (1991)).

Beside of environmental and health regulations the water services also underlay structural requirements. In § 28 of the Basic Law (Grundgesetz) is defined that the municipalities have the right to regulate all affairs of the local community on their own responsibility, however, they have to take account of the current legislation (see GG (1949): §28). Nonetheless, the right of self-governing the water services as part of the municipal public duty does not mean that it has to be fulfilled directly by the municipalities. Unless state law provisions do not prevent this possibility, the municipalities are allowed to transfer tasks to third, private entities or make use of cross-municipality solutions (see Ewers et al. (2001): 17). Further, regulations concerning organizational issues are made on state level by the State Water Laws (Landeswassergesetze).

The leading organizations in the field of water and wastewater are the Federal Association of Energy and Water (Bundesverband der Energie- und Wasserwirtschaft - BDEW), the German Association for Gas and Water for the Drinking Water sector (Deutscher Verein des Gas- und Wasserfaches - DVGW) and the German Association for Water, Wastewater and Waste (Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall - DWA) for the wastewater sector. In tendency, the BDEW focuses on political and economic issues, whereas the DVGW and DWA prioritise the technical and organisational challenges of the sectors. Moreover, DVGW and DWA are issuing bodies for the relevant technical guidelines, based on the contributions of sector experts from the industry and confirmed in an open participatory process.

A general regulatory authority does not exist in the German water industry, so it is in fact a kind of technical self-regulation. “The legal framework defines basic requirements for the quality, safety, sustainability, and

economic efficiency of water services, but it is the water sector itself which fills the legal framework with life through the definition of technical rules and standards" (Petry/Castell-Exner (2012): 18). Nevertheless, economic issues like water pricing are regulated ex post in case of the suspicion that the monopoly has been exploited. Depending on the organizational form, various regulatory authorities can take action, which is considered more detailed in the section *Economic Challenges* (see Dierkes/Hamann (2009): 33).

Dimension and Structure

In cooperation with other associations and stakeholders, the Federal Association of Energy and Water (BDEW) frequently publishes the *Profile of the German Water Sector*, which includes many statistics and further information regarding the water sector. This section presents the most relevant figures and numbers characterizing the dimension and structure of the German water market. In 2011 around 4,968 million m³ water was produced. 61.1 % of the used water was ground water, 30.5 % surface water and only 8.4 % spring water. Therefore, the ground water recharge is a relevant issue in Germany. In comparison to 1990 the amount of the total treated water indicates a decrease of around 1,800 million m³ or 27 % (see BDEW (2013): 2).

In total, the drinking water supply in Germany is organized by 6,211 companies. These companies serve 99 % of the German population via an approximately 530,000 km long net work (see BDEW et al. (2011): 34, 52). Besides the challenge of a declining population, the water consumption per capita of the remaining population is also decreasing, even though previous forecasts assumed an increasing per capita consumption. This development is presented in **Figure 1**. The current water consumption of around 122 litres per person and day leads in many places to underutilization of networks, which might be associated with hygienic challenges.

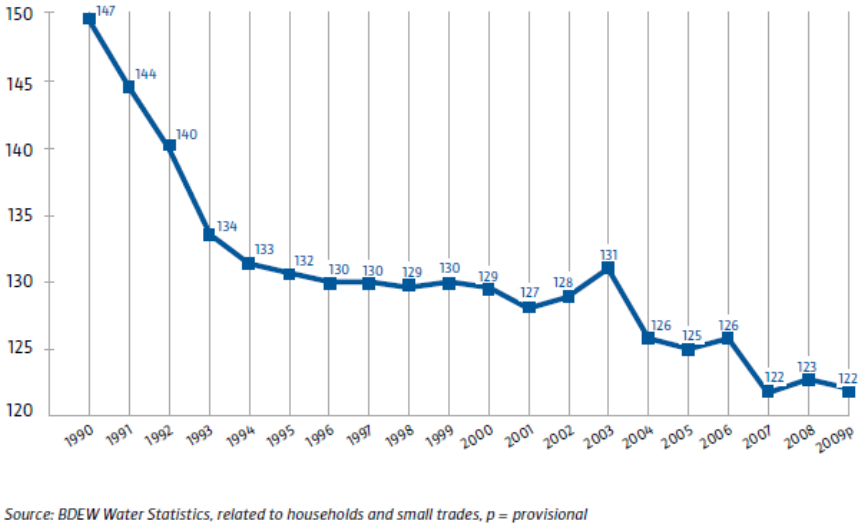


Figure 1: Development of the per-capita water consumption in Germany (in litres per person and day) (BDEW et al. (2011): 39)

The reliability of supply can be described as high. "Long, frequent service interruptions of water supply are unknown in Germany. This is due to the high technical standards and the excellent condition of plants and networks in comparison with other European countries. German water supply utilities have by far the lowest water losses" (BDEW et al. (2011): 48). Average water losses in Germany amount to approximately 6,5 % and the rate of main failures has further decreased during the last decade. Whilst in the period of 1997 – 2004 11,7 damages occurred per 100 km net work length, the number of main failures decreased to 9,9 per 100 km between 2005 and 2009. Nevertheless, benchmarking projects in different German states identify varying renewal rates from 0.4 to 1.2 % (see BDEW et al. (2011): 56f.). The renewal rates are very important in terms of sustainability. It is great to achieve good technical and qualitative standards, but the sector has also to ensure the future viability of the network. This fact similarly applies to the sewage network.

The current sewage connection rate amounts to 96.1 % in Germany. 95 % of the population is connected to wastewater treatment plants in accordance with highest technical EU standards. The wastewater piping system is

estimated to amount to 187,264 km, the storm water piping system 114,373 km and the combined water system is around 239,086 km long. Considering the age structure of the German sewer net work, it is striking that approximately 70 % of the pipes are younger than 50 years. Nevertheless, parts of the main system are much older. In order to ensure a sustainable maintenance, continuous investments are necessary (see BDEW et al. (2011): 52ff., 68).

On account of the legal framework in Germany, the municipalities have the option to fulfil tasks of general interest on their own or in collaboration with third parties. Among collaboration models different configurations are possible. The common management models can be divided into models under private and public law.

The public forms of organisation are mainly:

- Ancillary municipal utilities (Regiebetrieb)
- Owner-operated municipal utilities (Eigenbetrieb)
- Institution under public law (Anstalt des öffentlichen Rechts)
- Special purpose association (Zweckverband)
- Water and soil association (Boden- und Wasserverband)

The Regiebetrieb is fully embedded in the municipality. It is legally and organisationally dependent and does not have a separated accounting, so that surpluses are allocated to the General Fund. The Eigenbetrieb is also legally dependent, but organisationally and financially independent from the municipality. Therefore losses and profits are earmarked. The organisation of water supply as an institution under public law offers the strongest independence from the community. It is organizationally, financially and legally independent. Intermunicipal cooperation is possible via different association forms (Zweckverband/Boden- und Wasserverband) (see Cronauge (2003): 30ff., 114ff., 225ff.; Dierkes/Hamann, Rolf (2009): 169ff.).

Moreover, different private models exist in the German water market, from mixed public-private companies to autonomous private companies. Especially concessions play a major role in public-private-partnerships and are further discussed in the section on *Competition*. In the following the ownership structure of the drinking water and the wastewater sector as well as its development shall be presented.

As mentioned above, the total drinking water supply in Germany is organised by 6,211 companies. *BDEW et al. (2011)* have evaluated detailed characteristics of around 1,218 companies, which present 75 % of the total water production, ensuring the representativeness of the results concerning the structure of the German water market. This analysis shows that in 1993 aggregate water output was divided in almost equal shares between public and private suppliers, although the number of public water supply utilities was significant higher (see **Figure 2**). This confirms the assumption that private parties primarily operate in densely populated areas. Comparing the numbers of 1993 to the results of 2008, there is a tendency towards private organisational models, mostly in parts or entirely owned by the public entities.

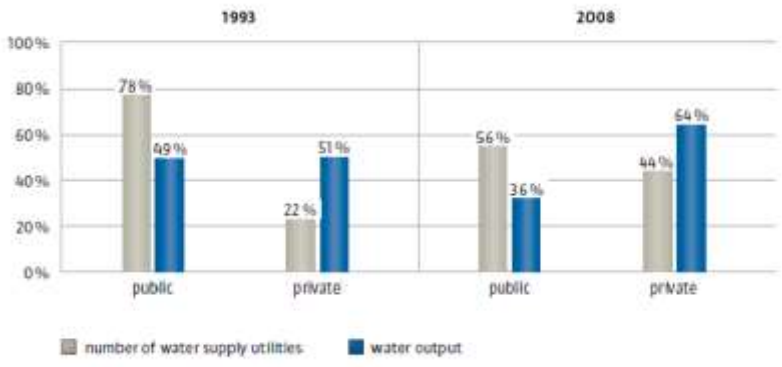


Figure 2: Development of the types of enterprise in the public water supply (under public/private law) (BDEW et al. (2011): 34)

The detailed ownership structure in the German water market is represented in

Figure 3 Under consideration of the water output, mixed public-private companies dominate the market with 26 %, followed by special purpose associations (17 %) and other private-law utilities (16 %). With only 1 % of the total water output, ancillary municipal utilities play almost no role in the drinking water sector.

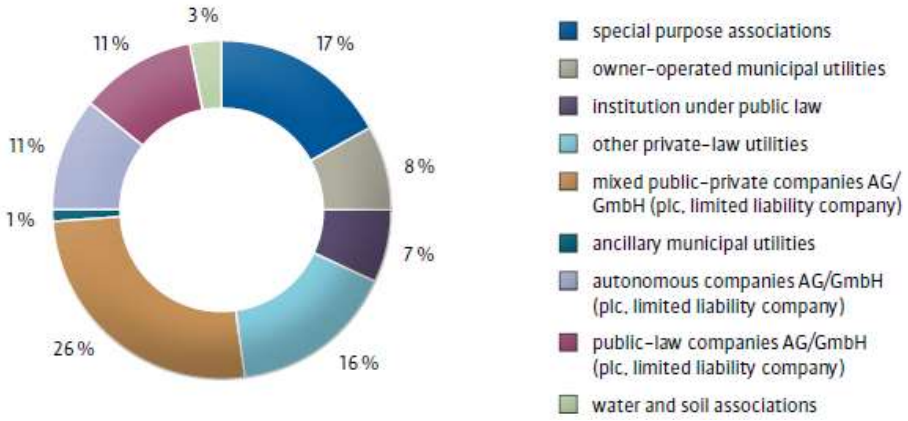


Figure 3: Types of enterprise in the public water supply 2008 (shares related to water output) (BDEW et al. (2011): 35)

Besides of the ownership structure also the size structure in the German water market is of great interest. **Figure 4** shows that less than 4 % of water utilities provide 60 % of the total water output in Germany. Further, it indicates that around 70 % of the water utilities are small companies with a water output of less than 0.5 million m³ per year. The total number of 6,211 water utilities combined with the results of **Figure 4** underline the fragmented structure of the drinking water market as well as its diversity. The largest German (end-user) water supply companies are Gelsenwasser, Berliner Wasserbetriebe, Stadtwerke München and Hamburg Wasser.

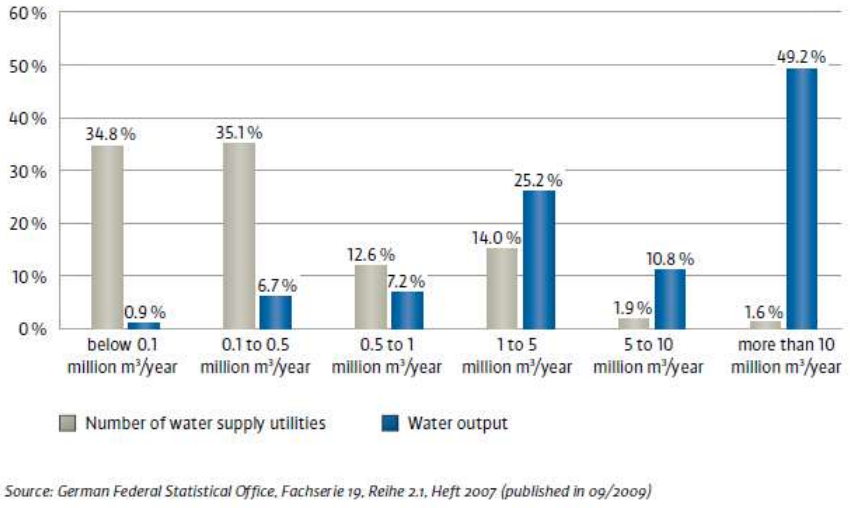


Figure 4: Size structure of water supply utilities in Germany 2007 (Shares as percent) (BDEW et al. (2011): 36)

In contrary to the drinking water sector almost every wastewater utility acts under public law. Private participation plays only a subordinate role in the sewage sector. The most common organisational form is the owner-operated municipal utility (37 %), followed by different intermunicipal associations (28 %) and institutions under public law (13 %). The size structure of the German wastewater market is similar to the one in the drinking water sector. Although the market can be described as fragmentized, a few large providers take care of the wastewater services in metropolitan areas (see BDEW et al. (2011): 36 ff.).

Competition

The legal framework fosters the utilisation of local water resources, thus, favouring a fragmented water supply in Germany. Moreover, due to the natural monopoly there is a lack of competition *in* the German water market. For physical and economic reasons, usually only one local water utility can prevail. The mounting of a second or further system in the field of water (and sewerage) is very expensive and not considered economically feasible (see e.g. Dierkes/Hamann (2009): 17). Further, an adequate legal framework for common carriage does not exist. However, even if the responsibilities could be clarified under an appropriate law, common carriage approaches will fail in most cases due to cost aspects. On the one hand, technical measures have to meet the requirements of a chemically and hygienically safe water mixture. On the other hand, the utility that wins the resource close to the supply area will always have a competitive advantage against utilities, which have to rely on water from distant regions, due to lower transport costs (see Mankel (2002): 42f.).

The municipalities' opportunity to tender the water services or parts of it can help to force more competition *for* the market (see European Commission (1999): 40). Companies are bidding for the right to fulfil the service (or parts of it) in a given period of time. Moreover, in most cases further requirements are determined in the contract like e.g. the level of customer service or environmental protection (see Oelmann (2003): 5). The municipality can choose the company with the best offer, which generally increases the pressure on the companies to compete in questions of expertise, efficiency and prices. Therefore, Demsetz (1968) already speaks about the "best price-quality package", which has to be considered. In Germany, concessions are the dominating model for the involvement of third private parties. These concession contracts affect typically the task fulfilment and not the task responsibility (see Dierkes/Hamann (2009): 143ff.). Whilst a recent European directive on the award of concessions fills the absence of clear requirements by an "[...] adequate, balanced and flexible legal framework […]", concessions in the water sector are excluded from this requirements since they "[...] are often subject to specific and complex arrangements which require a particular consideration given the importance of water as a public good of fundamental value to all Union citizens" (The European Parliament and the Council (2014): (1), (40)). In addition to concessions, operator models, management models and cooperation models are applied in the German water and sewage sector (see Dierkes/Hamann (2009): 143ff.).

This process creates a kind of limited competition *for* the market. Nonetheless, the contracts are typically long-term, so that this form of competition is mainly restricted to the time of the tender. Further, the advantages of a competitive concession bet can be missed, if the number of bidders is too low or (in the worst case) if there is no other competitor (see e.g. Garcia et al. (2005): 173, 180). The water and sanitation business is very specific, which naturally limits the number of potential bidders. Consequently, mostly the same players are active in a country's water market.

Role of Benchmark Activities

Besides the competition *for* the market, a competition *via comparison* is of particular interest in the German water market. Different benchmarking projects, efficiency analysis as well as price comparisons are omnipresent in the German water industry. The publication of current data and evaluation results informs the end-user about opportunities, simultaneously increasing the pressure on the providers to operate more efficiently. Customers' education and sensibility for water and wastewater related questions is necessary to foster the end-users influence on the performances.

The concept of benchmarking has gained significant attention, importance and acceptance in the water sector during the last decades (see Carvalho et al. (2012)). In the context of this development several definitions and methodologies have been raised. It can be commonly stated that "benchmarking is a tool for performance improvement through systematic search and adaptation of leading practices" (Cabrera et al. (2011): 2). Fundamental part of the concept is learning from others as well as having a closer look on internal processes to analyse which improvement actions are needed and how they can be implemented. As part of a benchmarking process, which is usually based on performance indicators, preparation and data acquisition, performance assessment via comparison as well as performance improvement are generally conducted. Whereas the first two stages are in most cases supported by the benchmarking organizer respectively regulator, the performance

improvement mostly stays a task of the utility (see Cabrera et al. (2011): 2, 28; 95-96). The success of these improvement measures can ideally be proofed during the next benchmarking event.

According to its scope benchmarking can be divided into metric benchmarking approaches (total approaches) and process benchmarking approaches: Metric benchmarking is a comparison of comprehensive performance indicators of different but at best similar utilities. It helps to provide comprehensive information, to identify the best and the weakest performance within a utility sample and is therefore a comparison tool, which is often used by regulators or public organizers to enhance performance pressure respectively competition (see Cabrera Jr. (2008): 5). In contrast, process benchmarking is less of general nature and focuses on specific processes within production. Thus, it offers the possibility to identify specific stages within the production that need further attention and assessment (see Berg (2010): 7).

In Germany, there are many regional benchmarking projects. In most German states (Bundesländer) water utilities have an opportunity to participate in non-obligatory projects (metric as well as process benchmarking). 11 out of 16 states also provide a public report with general performance respectively efficiency results, which is typically anonymous. It has to be noted that three of the provinces not providing a public project report are city states, so with a publication of results anonymity would be lost. Generally, the benchmarking projects are carried out periodically, so the utilities can see performance changes over several years (see BDEW (2012)).

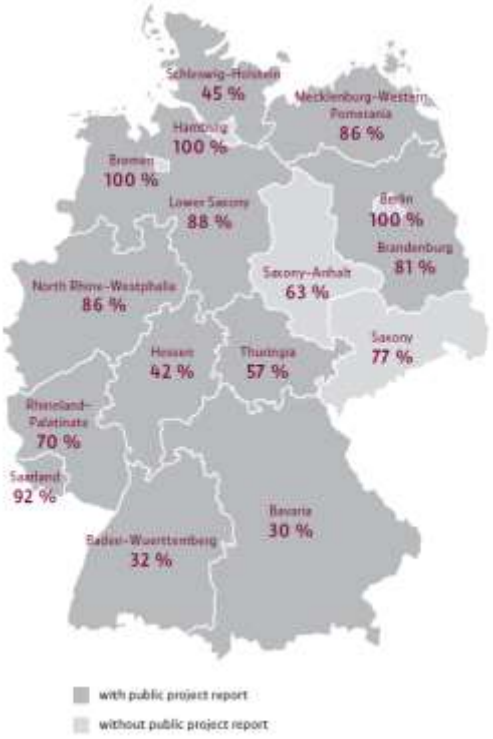


Figure 5: Participation Rate of Water Utilities (measured by drinking water provided) (BDEW (2012): 13)

Figure 5 gives an indication on the actual participation rate for each state. Even if benchmarks are non-obligatory in Germany, many utilities make use of this opportunity. Nonetheless, it has to be stated that in some federal states (Bundesländer), the participation rates are obviously far from average, especially when the number of utilities participating in benchmarking exercises is considered.

The benchmarkings largely stick to different performance indicators in the fields of reliability, quality, customer service, sustainability and economy. Benchmarking of water supply services is based on the IWA standard for performance indicators (see Alegre et al. (2000)), issued in a German adaptation by Hirner and Merkel (2005). To enable sooner or later a nationwide benchmarking, a unification of these indicators for all regional benchmarkings is discussed (see Otillinger (2011): 26). Besides regional and national benchmarking efforts, trans-national comparisons can help to share experiences and learn from the best. As example for trans-national

benchmarkings the one between Austria and the German state of Bavaria can be highlighted (see Theuretzbacher et al. (2005)).

Otillinger (2011) emphasizes that the German benchmarking activities show a positive, growing and dynamic development. Since there are many ongoing benchmark projects in Germany, the results of two selected projects shall be representatively summarized. *Hein and Merkel (2010)* point out that the process benchmarking in 15 drinking water plants in Germany helps participants to achieve transparency about process-related costs. Knowledge on their own cost ratio and cost types compared to the ones related to other treatment plants can be starting point for future strategic decisions and increased process efficiency. The consideration of specific processes allows deeper insights and is therefore a good addition to metric, comprehensive benchmarks. Similar water supply conditions and cultural, legal and socio-economic characteristics have made a cross-national benchmark between Bavaria and Austria possible. *Theuretzbacher et al. (2005)* describe this trans-national benchmarking as very successful. Beside the fact, that results show performances, which are comparable or even above international level, it can be taken as good example to further intensify international benchmarking co-operations.

Economic Challenges

To ensure a sustainable water supply and sewerage service for the future, further investments are indispensable. This also applies to Germany, if the current service level should be maintained. Main target is to make continuous investments to avoid unplanned high expenditures and related price increases. The investments of the water supply and wastewater removal industry amounted to approximately 110 billion Euros since the German reunification in 1990 (see BDEW et al. (2011): 75). The development of capital expenditures in both sectors is shown in the following figures.

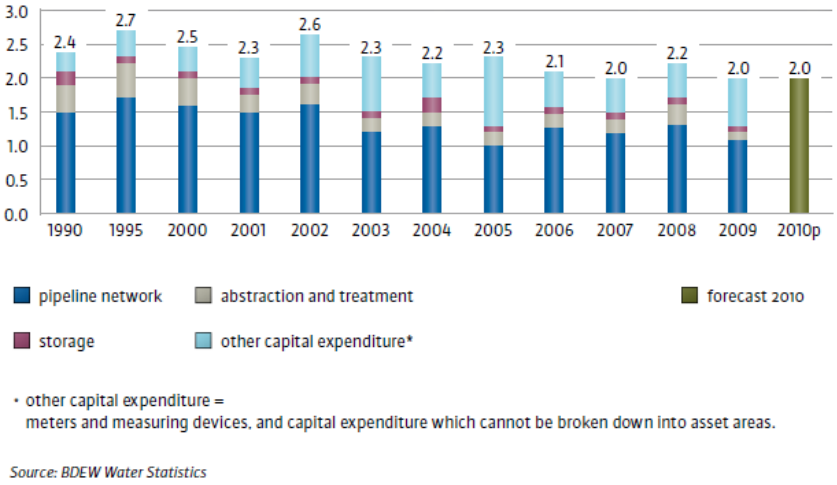


Figure 6: Development of capital expenditure in public water supply from 1990 to 2010 (according to asset areas, in billion Euros) (BDEW et al. (2011): 76)

During the last years the capital expenditure level in the water supply sector has been relative constant at about 2 billion Euros. It is striking that the bulk of investments flows in the pipeline network, whereas the investments in abstraction and treatment are decreasing (see **Figure 6**).

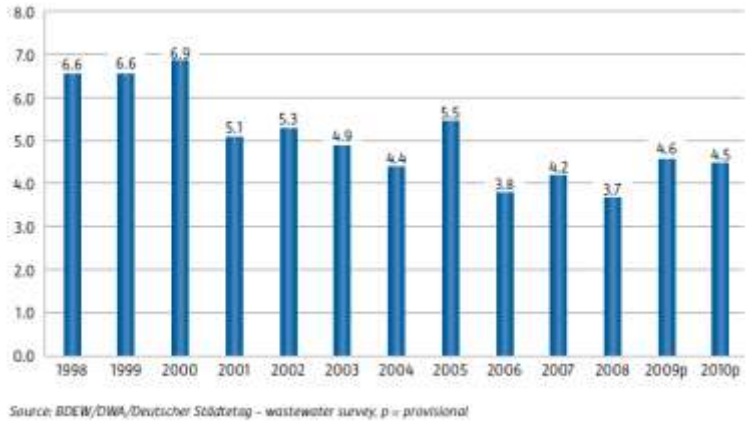


Figure 7: Development of capital expenditure in public wastewater supply from 1998 to 2010 (in billion Euros) (BDEW et al. (2011): 77)

The development in the wastewater sector is characterized by a less homogeneous trend. As illustrated in **Figure 7**, the capital expenditures have decreased significantly after 2000. This is due to the fact that capital investments related to the implementation of the EC Directive on Urban Wastewater Treatment were phased-out (see BDEW et al. (2011): 76). Comparing **Figure 6** and **Figure 7** it is noticeable that capital expenditures in the wastewater sector are more than twice as large as those in the water supply sector.

Subsidies play a minor or almost no role in the German water supply. The more important issue is a cost-covering price structure. Depending on the company's legal form, the water pricing is influenced by different frameworks. Whilst requirements for charges of companies under public law are made in the Municipal Charges Acts (Kommunalabgabengesetze - KAG) of the different states, water prices of companies under private law are not subject to specific regulations (see Reif (2002b): 52). “However, according to the rulings of the German Federal Supreme Court, the principles applied to the calculation of charges are to be applied in the same way to the calculation of prices” (BDEW et al. (2011): 23). According to *BDEW et al. (2011)*, the main obligations and principles are:

- Principle of equivalence (proportionality)
- Principle of cost recovery
- Prohibition of cost overrun
- Principle of equality or equal treatment
- Economic principles

Whilst the first obligations are self-explanatory, the economic principles may include the principle of preservation of net real-asset values or the principle of real capital preservation.

In the following **Figure** the supervisory and control of prices and charges is illustrated. It has to be emphasized, that the participation of private companies does not automatically lead to the collection of prices (see Reif (2002b): 53). The decisive factor is the legal form of the charging company. As presented in **Figure 8**, companies under public law can choose between charges and prices, whereas companies under private law are bound to prices.

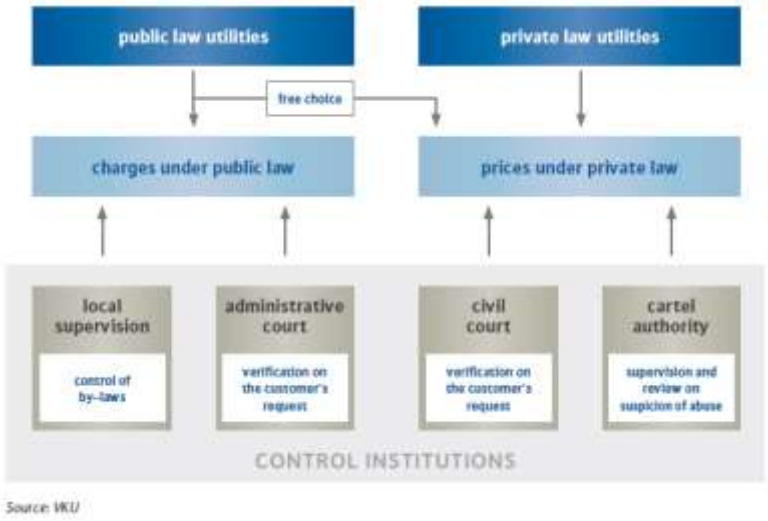
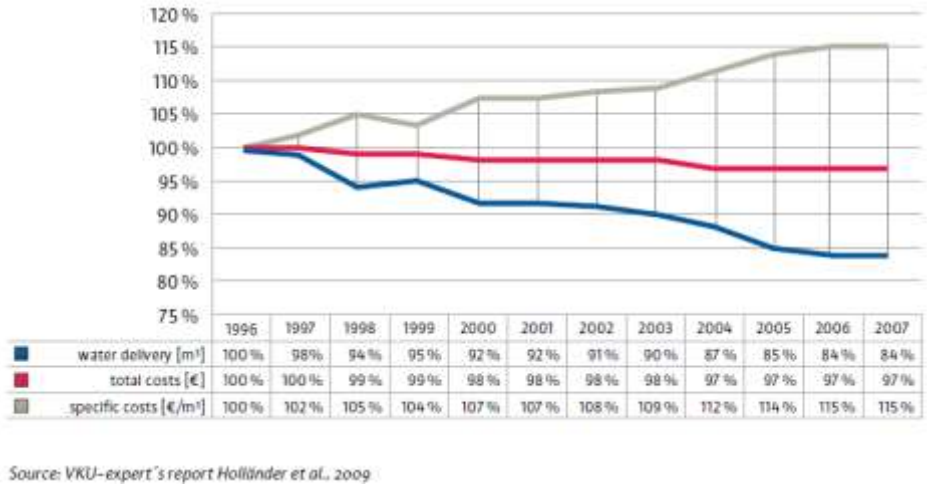


Figure 8: Control of prices and charges (BDEW et al. (2011): 24)

In the German drinking water supply sector dominates a two-part tariff model. Whilst the companies have to face extremely high fixed costs of about 80 %, the fix share of the tariffs is with about 10 – 20 % very small (see VKU (2011): 2; Merkel (2009): 78; Umweltbundesamt (1998): 51). In times of declining water consumption, this difference between the companies' cost and revenue structures is developing in a cost coverage gap. This means that German "water utilities sell less water to fewer people at increasing costs for infrastructure maintenance and renewal" (Petry/Castell-Exner (2012): 19). The following **Figure** illustrates the effects of decreasing water deliveries on total and specific costs.



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
water delivery [m³]	100 %	98%	94 %	95 %	92 %	92 %	91 %	90 %	87 %	85 %	84 %	84 %
total costs [€]	100 %	100 %	99 %	99 %	98 %	98 %	98 %	98 %	97 %	97 %	97 %	97 %
specific costs [€/m³]	100 %	102 %	105 %	104 %	107 %	107 %	108 %	109 %	112 %	114 %	115 %	115 %

Figure 9: Effects of decreasing water deliveries on total and specific costs (Relative evolution over time) (BDEW et al. (2011): 43)

It is striking that the specific costs significantly increase with declining water consumption. Therefore, there is currently a hot debate on adjustments of tariff designs in Germany. These adjustments are necessary on the one hand to ensure a sustainable cost recovery and on the other hand to meet the principle of equality or equal treatment. Otherwise, high usage consumers would pay the fixed costs for low usage consumers (see e.g. Oelmann/Haneke (2008)).

Currently the water prices strongly differ over the country. In particular, differences of up to a factor 6 were observed (see Hirschhausen et al. (2010): 76). This situation raises questions about price fairness among the population. Although price comparisons are not evident, because different local circumstances require different cost structures, the cartel authority of the state Hessen has imposed requirements for one water supplier to lower its water prices by 2007. This judgment was affirmed by the Federal Court in 2010 (see Daiber (2010): 226). To

avoid the decision, the affected company under private law has decided afterwards to operate under public law in the future. This case also offers a basis for discussion among the population as well as in the water sector. Especially the issue on legally accepted tariff respectively price calculation still remains not clearly resolved, in spite of current initiatives from the water associations for a price calculation guideline (see Reif (2002a): 19; BDEW (2010); BDEW/VKU (2012)).

The prices for drinking water include a reduced value added tax of 7 % (normal 19 %) and - depending on state law - a water abstraction levy. These water abstraction levies vary between 0 and 31 Cent per m³ abstracted water. Furthermore, the revenues from the water abstraction levies do not have a tied purpose in every state (see BDEW et al. (2011): 27f.). Between 2005 and 2013 the volumetric charges increased by approximately 8 %, whereas the basic charges increased during the same period by around 19 % (see Statistisches Bundesamt (2014): 1). In 2010 the average water price for households amounted to 1.91 Euro per m³, which already includes the share of the fixed price component (see BDEW (2011): 5). Considering the current daily water consumption of around 122 litres, this implies average annual water costs of around 85 Euros per person.[2]

The taxation of wastewater services is more differentiated. "Public wastewater disposal utilities as sovereign undertakings are exempt from corporate income and turnover tax. If a utility responsible for wastewater disposal uses a private third party to discharge this obligation, the latter is subject to the full turnover tax rate with the possibility of input tax deduction" (BDEW et al. (2011): 29). Similar to the water abstraction levy, the utilities have to pay a wastewater tax to the respective state and pass these additional costs directly to the end-consumer. In 2008 the revenues of the wastewater tax amounted to 254.05 million Euros (see EUWID (2011): 32). The average price per m³ wastewater (according to the freshwater scale) was around 2.28 Euros in 2005. Moreover, many utilities divide the according scale into storm water and sewage. In these cases, the average prices evaluated in 2005 amounted to 2.05 (sewage) and 0.88 Euros (storm water) (see BGW/DWA (2008): 2f.). Thus in Germany the average wastewater charges are generally higher than the charges in the drinking water sector.

Although water fees and their diverging ex post regulation are getting more and more into the focus of public debate and cartel authorities (see Daiber (2010)), it remains to be stated that the prices are generally affordable and the water costs do not play a decisive role in total household budget.

Lessons learnt from the German Case – Good Water Services without a Regulator?

The performance of municipal water services is to be evaluated in terms of the *service* they offer to their citizens. In general, the criteria for good water services are i) quality of water (drinking water and wastewater), ii) quality of service (reliability of supply/disposal), iii) sustainability of services in financial and technical terms and iv) the affordability in terms of adequate costs in relation to the service delivered.

Water/wastewater quality is determined by European and national legislation, and is regulated and controlled by the German government. With regard to the quality of service and the technical sustainability, the key success factor of the German water sector is the self-organised process of setting technical guidelines. In these technical guidelines, issued predominantly by DVGW and DWA, the water sector sets itself standards for good services in technical and organisational terms. In the example of water supply, the German Drinking Water Directive refers to these technical guidelines in the general clause to work *according to existing technical standards*. The standards specify relevant issues of good water services: continuity, minimum pressure, choice of processes, requirements for materials, prohibition of improper installations, testing procedures etc. In case of a malfunctioning of service, the water and/or wastewater utility – respectively the responsible engineering companies, suppliers, contractors etc. – have to proof that they acted according to the standards, or need to explain deviations under the specific circumstances. This system of self-regulation works quite effectively, is widely accepted among utilities and the government, and directs the optimum (self-)regulatory power to areas where it is needed most. The main drawbacks are that this democratic process of guideline-setting usually takes its time, and that the criteria of cost-effectiveness have to be enforced within the process.

The effective implementation of these guidelines in utilities of all sizes is of course an issue, and there are doubts if particularly small water and/or wastewater utilities have the manpower, knowledge and financial means to

[2] Estimation based on the calculation ((122*365)/1000)*1,91=85,05.

implement proper management and operation according to the guidelines. The implementation is enforced by regular governmental inspections, which is a quite effective process, but, however, not unlikely to fail under certain circumstances.

There is also a system of economic supervision in place for all water services, implemented on the regional government level, and a control system established on the level of the states' government (Landesrechnungshof). Thus, the supervision and control system should secure the technical and the economic sustainability of municipal water services. On the average, this clearly is the case, but there are cases known where cost-coverage and renewal levels were insufficient.

As pointed out before, there is a wide spread of prices/tariffs all over the country, which for itself is not the problem. There are areas, where the provision of drinking water or the adequate disposal of wastewater require more sophisticated infrastructure and are more expensive than in other regions. From the citizens' point of view, these circumstances are not always obvious, so that public debates arise regularly. Tariff or price control for water services – as the control of other public services – are also accepted governmental responsibilities. Citizens have the right to request tariff respectively price control, and in recent years, governmental institutions in several federal states have taken the initiative for a formal price check, using data from comparable utilities for the evaluation. So even without a direct economic regulation, there are supervising functions installed in governmental institutions, which effectively protect citizens from the utilities' abuse of their monopolistic position.

Conclusion

The described challenges, organizational structure and technical level of the German water sector cause different views and opinions on its self-organisation. *Boscheck (2002)* highlights that proponents of the self-regulatory model see the good status quo of the systems under an individual public responsibility reflecting the tradition of municipal subsidiarity, whilst opponents of the model criticize that the high fragmentation level being associated with the model causes in particular inefficiencies in operations and investments.

Measuring the success of a certain system or an organizational design is not trivial. On the one hand, a direct comparison to another alternative water sectoral structure facing exactly the same challenges and characteristics is not possible. On the other hand, appropriate performance indicators have to be identified, which allow a conclusion on the success. In general, it can be stated that a water sector is working, if technological requirements (connection to the network, reliability of supply etc.) and quality standards are met *now* and if this form of structural framework ensures that these targets will also be met in the *future*, at both times under the constraint of price affordability.

As presented in this paper, the German water sector is currently characterized by good technical conditions and an excellent drinking water quality. The prices are affordable even though they are not equal over Germany due to regional circumstances. Furthermore, the reputation of the German water utilities is very good as around 91 % of the customers are satisfied with the service of their local water supplier and about 77 % are satisfied with their sewage company. Nonetheless, it has to be stated that many Germans (around 65 %) are not aware of their actual water consumption or their specific annual water costs (see BDEW et al. (2011): 62, 65). On the one hand, this is an indication for the drinking waters' affordability as the consumption and costs are not in the consumers focus, on the other hand it, shows that water services are mostly taken for granted. A higher transparency and information level could help to sensitize customers for the good performances and the utilities' challenges. Especially, if ongoing demographical changes make tariff respectively price adaptations necessary, it is important to get the consumer involved . Moreover, clearer requirements on the (economically) appropriate and (legally) correct calculation of prices and fees would help to avoid uncertainties amongst utilities and to mitigate public debates.

For Germany, it can be stated that competition via comparison should be further intensified, because it is a kind of competition, which is not hindered by the regulatory, legal framework. Moreover, creating a higher obligation

and the development of industry standards should be discussed (see Ottilinger (2011): 26). This can help to enlarge the sample, improve the nation-wide comparability and achieve even more transparency for stakeholders and customers. Further, the intensification of cross-border benchmarkings can help to see the bigger picture and ensures the avoidance of project stagnation. The latter is also true for enhanced application of process benchmarks (see Cabrera Jr. (2008): 7).

It should be noted, that the long-term tradition of self-governance seems to be a prerequisite for the proper functioning of the non-regulated water sector in Germany. All in all, the German self-organised water market model works well under the specific German conditions and it can also be expected to work under future challenges. Nonetheless, it will require further efforts, development and above all open-mindedness of all stakeholders for new options and measures in the water market to maintain the current excellent level.

References

Abwasserverordnung (1997): Verordnung über Anforderungen an das Einleiten von Abwasser in Gewässer (Abwasserverordnung - AbwV) from 21st March 1997, last update 2nd May 2013 (BGBl. I S. 973).

Alegre, Helena; Hirner, Wolfram; Melo, Jaime Baptista; Parena, Renato (2000): Performance Indicators for Water Supply Services, 1st edition, IWA publishing, London, 146 p.

BDEW - Bundesverband der Energie- und Wasserwirtschaft (2010): Eckpunkte einer Wasserentgeltkalkulation in der Wasserwirtschaft, URL from 3rd April 2014: https://www.bdew.de/internet.nsf/res/1996251221D35BF5C12578A40044E677/$file/100617_Eckpunktepapier_Praxisbeispiel_HP.pdf.

BDEW - Bundesverband der Energie- und Wasserwirtschaft et al. (2011): Profile of the German Water Sector – 2011, URL from 23rd March 2014: http://www.bdew.de/internet.nsf/id/9F6D4ED10B74BCAEC12579570033822C/$file/111129_Profile_german_water_2011_long_.pdf.

BDEW - Bundesverband der Energie- und Wasserwirtschaft (2011): Wasserfakten im Überblick.

BDEW - Bundesverband der Energie- und Wasserwirtschaft (2012): Benchmarking: „Learning from the best" – Comparison of performance indicators in the German water sector, URL from 23rd March 2014: http://www.bdew.de/internet.nsf/id/86735E87EB0C1177C12579EB004E1B9F/$file/120301_BDEW_Wasser_Benchmarking_Broschuere_engl.pdf.

BDEW - Bundesverband der Energie- und Wasserwirtschaft; VKU – Verband kommunaler Unternehmen (2012): Leitfaden zur Wasserpreiskalkulation – Gutachten Kalkulation von Trinkwasserpreisen.

BDEW - Bundesverband der Energie- und Wasserwirtschaft (2013): Wasserfakten im Überblick, URL from 23rd March 2014: http://www.bdew.de/internet.nsf/id/C125783000558C9FC125766C0003CBAF/$file/Wasserfakten%20-%20%C3%96ffentlicher%20Bereich%20August%202013.pdf.

BGW / DWA - Bundesverband der deutschen Gas- und Wasserwirtschaft / Deutschen Vereinigung für Wasserwirtschaft, Abwasser und Abfall (2008): Wirtschaftsdaten der Abwasserentsorgung, URL from 23rd March 2014: http://www.bdew.de/internet.nsf/id/DE_Wirtschaftsdaten_der_Abwasserentsorgung_2005/$file/Wirtschaftsdaten-Abwasser%202005.pdf.

Berg, Sanford (2010): Water Utility Benchmarking – Measurement, Methodologies and Performance Incentives, IWA Publishing, London.

Boscheck, Ralf (2002): European Water Infrastructures: Regulatory Flux void of Reference? – The Cases of Germany, France, and Engalnd and Wales, in: Intereconomics, Vol.37, Issue 3, pp. 138 – 149.

Bundesministerium für Gesundheit (2011): Bericht über die Qualität von Wasser für den menschlichen Gebrauch (Trinkwasser) in Deutschland, Berlin.

Cabrera Jr., Enrique (2008): Benchmarking in the water industry: a mature practice?, in: Water Utility Management International, Vol. 3, Iss. 2, pp. 5-7.

Cabrera, Enrique; Dane, Peter; Haskins, Scott; Theuretzbacher-Fritz, Heimo (2011): Benchmarking Water Services – Guiding water utilities to excellence, IWA publishing, London.

Carvalho, Pedro; Marques, Rui Cunha; Berg, Sanford (2012): A meta-regression analysis of benchmarking studies on water utilities market structure, in: Utilities Policy, Vol. 21, pp. 40-49.

Cronauge, Ulrich (2003): Kommunale Unternehmen: Eigenbetrieb – Kapitalgesellschaften – Zweckverbände, Erich Schmidt Verlag, Berlin.

Daiber, Hermann (2010): Die Entscheidung des Bundesgerichtshofes vom 2. Februar 2010, „Wasserpreise Wetzlar" – neuere Entwicklungen des Wasserkartellrechts, in: gwf-Wasser Abwasser, Vol. 151, No. 3, pp. 226 - 235.

Deutscher Wetterdienst (2014a): German Climate Atlas – Air Temperature, URL from 23rd March 2014: http://www.dwd.de/bvbw/appmanager/bvbw/dwdwwwDesktop?_nfpb=true&_windowLabel=dwdwww_main_book&T17940019062130865454263 6gsbDocumentPath=&switchLang=en&_pageLabel=P288001906213086544 63391.

Deutscher Wetterdienst (2014b): German Climate Atlas – Precipitation, URL from 23rd March 2014: http://www.dwd.de/bvbw/appmanager/bvbw/dwdwwwDesktop?_nfpb=true&_windowLabel=dwdwww_main_book&T17940019062130865454263 6gsbDocumentPath=&switchLang=en&_pageLabel=P288001906213086544 63391.

Dierkes, Mathias; Hamann, Rolf (2009): Öffentliches Preisrecht in der Wasserwirtschaft, Nomos Verlag, Baden-Baden.

DVGW – Deutscher Verein des Gas- und Wasserfaches e.V. (2009): Climate Change and Water Supply, URL from 23rd March 2014: http://www.dvgw.de/fileadmin/dvgw/wasser/ressourcen/info_climatechange_en_100525.pdf.

European Commission (1999): European Economy – Liberalisation of Network Industries, in: Reports and Studies, No.4.

EUWID (2011): Umfassende Wassernutzungsabgabe statt Abwasserabgabe und Entnahmeentgelt?, in: EUWID Wasser Special, No. 2.

Ewers, Hans-Jürgen; et al. (2001): Optionen, Chancen und Rahmenbedingungen einer Marktöffnung für eine nachhaltige Wasserversorgung, BMWi-Forschungsvorhaben 11/00, Endbericht Juli 2001.

Garcia, S.; Guérin-Schneider, L.; Fauquert, G. (2005): Analysis of water price determinants in France: cost recovery, competition for the market and opertor's strategy, in: Water Science and Technology: Water Supply, Vol. 5, Iss.6, pp. 173-181.

GG - Grundgesetz für die Bundesrepublik Deutschland (1949): Grundgesetz from 23rd May 1949 (BGBl. S.1), last update of 29th July 2009 (BGBl. I S.2248).

Hein, Andreas; Merkel, Wolf (2010): Process Benchmarking in Drinking Waterworks in Germany, in: gwf-Wasser Abwasser, Vol. 151, International Issue S1/2010, pp. 64 -70.

Hirner, Wolfram; Merkel, Wolf (2005): Kennzahlen für Benchmarking in der Wasserversorgung. wvgw-Verlag Bonn.

Hirschhausen, Christian von; et al. (2010): Wasser: Ökonomie und Management einer Schlüsselressource, Deutsches Institut für Wirtschaftsforschung, Berlin.

Hoffjan, Andreas; Müller, Nicole Annett (2011): Contemporary Market Structure and Regulatory Framework, report within the EU Research Project TRUST, URL from 26th March 2014: http://www.trust-i.net/downloads/index.php?iddesc=34.

Hoffjan, Andreas; Müller, Nicole Annett, Reksten, Håkon (2014): Enhancing Competition and Efficiency in the Urban Water Industry, internal report within the EU Research Project TRUST.

Libbe, Jens (2014): Zukunftsfähige Wasserwirtschaft zwischen Zentralität und Dezentralität, 47. Essener Tagung für Wasser- und Abfallwirtschaft, pp. 6/1-6/2.

Lotze, Andreas; Reinhardt, Michael (2009): Die kartellrechtliche Missbrauchskontrolle bei Wasserpreisen, in: Neue Juristische Wochenzeitschrift, Vol.62, No.45, pp.3273 – 3278.

Mankel, Bettina (2002): Wasserversorgung: Marktöffnungsoptionen umfassend nutzen, Wirtschaftsdienst, Vol.82, Iss.1, pp. 40-43.

Merkel, Wolfgang (2009): Wasser- und Abwasserwirtschaft: Sicherheit und Qualität bestimmen den Preis, nicht umgekehrt, Tagungsbericht von der Handelsblatt-Jahrestagung 2008, in: gwf – Wasser | Abwasser, Vol. 150 (2009), No. 1, pp.72 –79.

Oelmann, Mark; Haneke, Carsten (2008): Herausforderung demographischer Wandel: Tarifmodelle als Instrument der Nachfragestabilisierung in der Wasserversorgung, in: Netzwirtschaften & Recht, Vol. 5, No. 4, pp. 188 – 194.

Otillinger, Franz (2011): Benchmarking – was hat es bislang bewirkt und wie geht es weiter? in: energie | wasser praxis, Vol.62, Iss.5, pp. 24-26.

Petry, Daniel; Castell-Exner, Claudia (2012): Current issues and challenges addressing the German drinking water sector, in: bluefacts – International Journal of Water Management, Vol. 3, pp. 16-20.

Reif, Thomas (2002a): Preiskalkulation für eine moderne Wasserwirtschaft, in: energie | wasser praxis, Vol.53, Iss.12, pp. 14-19.

Reif, Thomas (2002b): Preiskalkulation privater Wasserversorgungsunternehmen, Wirtschafts- und Verlagsgesellschaft Gas und Wasser mbH, Bonn.

The Council of the European Communities (1991): COUNCIL DIRECTIVE 91/271/EEC concerning urban waste water treatment of 21st May 1991.

The Council of the European Union (1998): COUNCIL DIRECTIVE 98/83/EC on the quality of water intended for human consumption of 3rd November 1998.

The European Parliament and the Council (2014): DIRECTIVE 2014/23/EU - Directive on the award of concession contracts from 26th February 2014.

Statistische Ämter des Bundes und der Länder (2011): Demografischer Wandel in Deutschland.

Statistisches Bundesamt (2011): Statistisches Jahrbuch 2011 – Bundesrepublik Deutschland.

Statistisches Bundesamt (2014): 1000 Liter Trinkwasser kosteten 2013 im Durchschnitt 1,69 Euro, URL from 23rd March 2014: https://www.destatis.de/DE/PresseService/Presse/Pressemitteilungen/2014/03/PD14_110_322.html.

Theuretzbacher-Fritz, H.; Schielein, J.; Kiesl, H.; Kölbl, J.; Neunteufel, R.; Perfler, R. (2005): Trans-national water supply benchmarking: the cross-border co-operation of the Bavarian EFFWB project and the Austrian OVGW project, in: Water Science and Technology: Water Supply, Vol.5, No.6, pp. 273 – 280.

Trinkwasserverordnung (2001): Trinkwasserverordnung from 21st May 2001 (BGBl. I S.959), last update 14th Dezember 2012, published 2nd August 213 (BGBl. I S. 2977ff.).

Umweltbundesamt (1998): Vergleich der Trinkwasserpreise im europäischen Rahmen, Ecologic – Gesellschaft für Internationale und Europäische Umweltforschung, Berlin.

Umweltbundesamt (2010): Water Resource Management in Germany – Part 1 – Fundamentals.

VKU - Verband kommunaler Unternehmen (2011): Fragen und Antworten – Wasserpreise und Gebühren, URL from 23rd March 2014: http://www.vku.de/service-navigation/presse/publikationen/fragen-und-antworten-wasserpreise-und-gebuehren.html.

WHG - Wasserhaushaltsgesetz (2009): Gesetz zur Ordnung des Wasserhaushalts from 31st Juli 2009 (BGBl. I S.2585) last update 7th August 2013 (BGBl. I S. 3154).