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Towards more Competition in Water Infrastructure – Which Regulation do we Need?

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Abstract

For decades water infrastructure has been regarded as given and free, with water supply being the duty of the state. This perception of water infrastructure is not longer suitable, as it can be classified as a private good. To open this infrastructure sector for private participation and more competition, a sound regulatory framework is needed – caused in particular by the characteristics of water infrastructure as a natural monopoly. The introduction of more competition is a challenge for all actors involved, the public administration as well as private enterprises and user groups. In our paper, after a short introduction and analysis of the main characteristics of water infrastructure, we delineate and discuss different regulation models that could ensure more competition in water infrastructure, and the interest of actors involved, in particular the political-administrative constraints. Policy recommendations and a brief outlook conclude the paper.

Keywords: Water supply, Regulation, Competition, Private Sector Participation

Introduction

For decades, water infrastructure has been regardedas given and free, with water supply being the duty of the state, mostly on the municipal level. This viewon water infrastructure is no longer suitable. The reasons for thisshift are twofold: On the one hand, with a view on economic theory, we have to realize that water supply can be classified as a private good, which can (and should) be provided by private enterprises or in cooperation between private firms and a public partner (Public Private Partnerships - PPP).

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On the other hand, with a view on the existing and severe financial restrictions the public sector faces in many countries worldwide, we can state that the public sector alone is no longer able to provide sound and efficient water infrastructure. The need to rehabilitate, repair or replace the distribution systems for water in developed as well as developing countries is high and increasing, not least with a view on demographic change: While in most developed countries the infrastructure is relatively old and shrinking population, there is a need for deconstruction and/or modernisation of infrastructure facilities. Furthermore, as in most developing countries the population is increasing rapidly, new infrastructure has to be built or an upgrading of existing water infrastructure is needed.

Private enterprises in this context are able to provide more than sheer money – this is the case as conventional wisdom says that private enterprises can contribute not only much-needed financial resources, but superior management know-how and technical expertise (see for details on the positive effects of private sector participation *Rees* 1998).

To open this infrastructure sector for private participation and more competition, a sound regulatory framework is required– caused by the characteristics of water infrastructure as a natural monopoly, which could lead to market failure and the related, undesirable outcomes for the society. Even if water infrastructure could be provided by PPPs, regulation is needed to secure competition in the bidding process. Therefore, the introduction of more competition in water infrastructure is not only a problem for economic policy, but also a challenge for the other actors involved. Especially the public administration is facing this challenge, as regulatory institutions must be provided and the capacities for the implementation of PPPs must be created.

Characteristics of Water Infrastructure

Water is an important and, in some way, specific good in the perception of many cultures – this applies not only to water as a natural resource, but also to water as a good provided by network infrastructure. However, in this context, we have to distinguish between two types of water: While it is relatively difficult to define property rights in floating water and the world's seas, due to its physical characteristics, water in infrastructure utilities is coined by some characteristics that allow us to classify it as an economic good.

In economics, each good can be classified following the criteria of "rivalry" and "exclusion of non-paying users": If a good cannot be used from more than one user at the same time, or the use is restricted when being used by more than one person ,the degree of rivalry is high. For water infrastructure, rivalry exists, as one unit water itself cannot be used by more than one person at the same time, and even the tube can not be used by as many people. The degree of rivalry therefore is relatively high. The answer to the question whethernon-paying users can be excluded, is relatively simple, as non-paying users can be technically disconnected from the network, or the provision of water can be restricted. While this procedure induces costs, they not prohibitively high, so that the option of exclusion is given. To sum up the "economics of water" delineated above, water can be classified as a private good, and consequently can be provided privately. Additionally, there are other reasons why the public sector should not provide infrastructure, following *Rees* (1998: 5):

- Public institutions are insulated from the competitive incentivesfound within free markets
- Public enterprises may be exposed to short-term political interventions,struggles for political advantage and the demands ofsingle interest groups for privileges
- Managers in public enterprises can pursue their own interests rather thanthe public interest asthe ultimate owners – the taxpayers themselves– have only few effective mechanisms of control, to signal their requirementsor dissatisfaction with the management of the utility or to execute their will

Furthermore, there are specifics that lead to market failure in the water sector: Water supply is characterised by a natural monopoly in the service network/water distribution, which is given if one supplier in an industry has a specific cost advantage over other current and/or potential competitors, and has no substitutes. The cost advantages in natural monopolies mostly arise from so-called "economies of scale", advantages from the size of a network or facility, which lead to lower average costs with rising output. For water infrastructure, the network is determining the highest share of the total costs[i] of the facility. Economies of scale are given here according to the so-called "two-third rule", which states that with a doubled diameter the circumference of the tube (which is costly) only raises by two thirds, so that it is efficient if only one provider delivers the network.

As the costs of market entry therefore are high and "sunk" – you have to invest in the utility and the network before you can start your business – high barriers to market entry for potential competitors exist.

Other factors are just as important in this context and have to be scrutinized: Not least because of the potential health and safety implications, which can be classified as positive or negative externalities, water infrastructure is of specific importance for a country. Sound water supply will have positive effects for the society as a whole, insufficient water supply will originate negative effects, e.g. through the origin of diseases or rising child mortality. The problem in this context is the fact that externalities are incurred by a (third) party thatdoes not agrees to the transaction *ex ante*, and are not transmitted through prices. Prices therefore are either too high or too low in these cases and do not reflect the full costs or benefits, so that unwanted social consequences could occur.

To sum up, despite water infrastructure being a private good, due to the existing market failure a provision by private enterprises without constraints bears some risks, as the exploitation of the so-called "monopoly rent" through the monopolist, decreasing water quality provided or a decreasing quantity in the market. Thus,to solve these problems, several options are possible, with government provision or regulation to name the most important ones to compensate the persisting economic inefficiencies.

Which Regulation do we need?

Market failure being given in the water sector, traditionally the state itself, in most cases the municipal level, has been providing water infrastructure. This *status quo (ante)* is changing, as a "more economic approach" and real budgetary constraints demonstrate that water infrastructure should be provided privately. A sound regulation in this context is a *conditio sine qua non* when we come to private provision. Two general options exist: An involvement of the private sector in the form of Public Private Partnerships, or a full privatisation.

3.1.Public Private Partnerships – Regulation by Contract

In the case of PPPs, the public sector and a private enterprise conclude a contract specifying the depth of the private enterprise's involvement.

PPPs in general are "arrangements whereby private parties participate in, or provide support for, the provision of infrastructure, and a PPP project results in a contract for a private entity to deliver public infrastructure-based services" (*Grimsey* und *Lewis* 2005: xiv). PPPs comprise at least two value creation levels, not only one specific phase (like construction of the utility or billing), the contract has an implicit long-term nature.[ii] Furthermore, the contract assures control mechanisms for the public partner, while costs and risks are transferred to both partners: „In PPPs, public and private parties (actors) *share* costs, revenues and responsibilities"(*Bult-Spiering* und *Dewulf* 2007: 3). Because the contract is normally allocated through a call for tenders, there is a kind of "competition for the market", even if the winning private company holds the monopoly of provisionafterwards. In these cases there is no regulation in the market – as no market exists – , but the bidding process itself assures some competition. The enterprise that is able to deliver the service at the best price and/or quality will win the bidding process, regulatory measures likeperformance targets, price levels and mechanisms for price adjustments, quality specifications or efficiency ratios are specified in the contract (*Rees* 1998: 18). The necessary precondition in these cases is that there are several bidders available, so that not the only bidder can hold up the public partner, and that the bidders act non-collusively. To ensure this, before a bidding process starts, the public partner needs a good overview over potential private partners.

One significantproblem in all PPPs is the existing information asymmetry between the partners, which leads to severe constraints to use this instrument in practice: In a PPP it is almost impossible for the public partner, the municipality, to control the private partner once the contract is closed. This "principal-agent" problem may result in decreasing quality of service, underinvestment (if the private company has to bear the investment costs) or increasing prices to the consumers (if prices are not fixed by the contract design). This problem is as more pressing as the contract duration can be relatively long (up to 30 years), so that it is almost impossible to foresee all future events or upcoming problems (*Schomaker* 2011: 222). To overcome this constraint, an all-comprising, "complete" contract would be necessary – nearly impossible in practice and costly due to transaction costs related to contract supervision and monitoring, contract enforcement and so on (see for details on incomplete contracts *Hart* 2005).

Another problem may be that competition is restricted in the rebidding of contracts due to insider knowledge of the current private contract holder, which therewith has an advantage over the public partner whois no longer completely free to choose a new partner.

On the other hand, the private partner does not know *ex ante* which specifications the network has in detail, as he cannot control all details, e.g. the technical conditions of the subsurface networks, at appropriate cost. Therefore, he has to trust the public partner, his true commitment to the PPP, or his general reputation as being reliable. Otherwise, he would be forced to control as much of the utility as technically and administratively possible, which will increase the transaction costs related to the contract. In general, the higher the trust between the partners is, the lower the risk of one-sided opportunistic exploitation (*Schomaker* 2011: 223).

3.2. Regulation – Chance and Challenge

As a kind of "enlargement" of the PPP-approach, privatisation can be undertaken in two different ways: The option of divestment transfers or full privatisation means transferring the full ownership of the "assets into private hands as well as giving the private companies responsibility for all operations, maintenance, revenue raising and investment" (*Rees* 1998: 16). The second option, the award of a concession, means that the utilities remainin public property, a private enterprise havingthe exclusive right to use the utility as well as the responsibility for operation, system maintenance and investments during the concession period.This type of privatisation can be classified as a subform of PPPs too, as several control mechanisms remain with the public sector (*Rees* 1998: 16-17). Differences in the regulatory tasks are the consequence, as a concession which has to be reiterated after a few years generally faces the same problems in the context of contract design as a PPP (*ex ante* or *ex post* information asymmetry, hold-up problems), while in the case of a full privatisation the question of a long-lasting regulation process occurs.

Independent of the model used in detail, there is one main problem related to regulation in all fields: The existence of imperfect links between the legislature, the regulating unit and the regulated process itself. Therefore, in many cases "regulation may be excessively costly [and] may result in considerable cheating […]. Another lesson is that legislature does not necessarily act as an efficient benevolent maximizer of social wellbeing" (*Castro e Silva* and *Real de Oliveir* 2004: 2).

In the case of water infrastructure, regulation should ensure an adequate quantity and quality of water provided at reasonable costs for the users under the constraint of environmental protection (social efficiency) and (full) cost coverage (economic efficiency). So, which regulation do the different groups involved demand?

- The user is interested in water provision being as cheap as possible, and from a good quality, so they will be interested in a regulation that assures price stability at a low level and high quality standards. Regulation itself should not raise the price of the water, nor should it affect job opportunities etc. negatively, as the user is a voter at the same time and will sanction the government for regulation that has high social costs.
- The regulator itself, in the normal case a public authority or state body, is interested in a regulation that is relatively easy to execute and not too expensive – i.e. the information needed must be approachable, and the additional costs through the collection of information or at least time costs should be relatively low.The budget of the authority is relatively fixed. At the same time, there might be an incentive to increase regulatory efforts, or at least to signalise actions like this, as this behaviour might increase the budget of the regulatory body (*Niskanen* 1971).
- For the private water company, it will "demand regulation that does not harm [its] competitiveness" (*Castro e Silva* and *Real de Oliveir* 2004: 11). The firm will try to minimise the compliance costs and avoid costly investment due to regulatory measures and so on. Furthermore, there is some evidence that regulation is often demanded by private enterprises, e.g. to increase their own market (share), curb risks or reduce competition by creating entry barriers (e.g. in detail *Stigler* 1971).

Obviously, there are conflicts amongst the interest groups over the regulation *modi* and instruments used, as well as the "regulatory depth", the final intensitity of regulation. The outcome – the regulatory regime or framework – can be classified not as a fixed status, but as the product of an (ongoing) bargaining process, the "outcomes of which will very much depend on the resources (power) and needs of the various players" (*Rees* 1998: 27).

In general, in PPPs and especially concessions as well as in the case of a full privatisation, there is some competition for the market, as outlined above.

Additionally, some competition in the market can be assured for all stages of the value creation chain that are non-monopolistic, such as water extraction and treatment. From a competitive and regulatory point of view, before it comes to regulation, the infrastructure should be vertically disaggregated (separate enterprisesfor each level or service function – water extraction and treatment, water distribution, and so on), so that the regulatory bottleneck, the monopoly, can be regulated selectively (see in detail *Rees* 1998: 21-25). This "unbundling" will lead to more competition with its positive effects for the consumers, as well as to less regulatory effort for the public regulatory body. In the case of water, which is very sensitive concerning quality issues, unbundling is relatively complex, as different water companies will provide water of different qualities, and it is not easy to distinguish which water the consumer uses in the end. An especially high quality of the water provided therefore would lead to relatively high costs for the producers, without an appropriate willingness to pay from the user side. Therefore, at least in the long run, a "race to the bottom" can be expected. Nonetheless, as in most industrialised countries like the EU water laws provide a high minimum standard for water quality, severe quality problems are not likely.

As regarded by the literature, there are specific cases where the regulation of markets might "fail" in the sense that it will "reduce rather than increase economic welfare" (*Kirkpatrick* and *Parker* 2004: 8). There are several examples, like the phenomenon of regulatory capture, as outlined i.a. by *Bernstein* (1955) as well as *Laffont* and *Tirole* (1991): Regulatory capture can be seen as a specific form of government failure, occurring when enterprises or a specific industry, which has a financial stake and/or strong interest in regulatory activities, influences regulatory bodies effectively in their own interest. Regulatory capture occurs alike when the regulator is susceptible to specific political interests and lobbying groups (see in detail *Stigler* 1971, *Kirkpatrick* and *Parker* 2004).

Another case may be severe inefficiencies in investment. *Averch* and *Johnson* presented a model showing that the regulation of a firm's rate of return could lead to specific incentives of over-investment (*Averch* and *Johnson* 1962). In general, regulation faces the same information problems as outlined above, as the regulatory body and the regulated enterprise "can be expected to have different levels of information about such matters as costs, revenues and demand (*Kirkpatrick* and *Parker* 2004: 9).

In detail, there are several methods for the regulation of water utilities, with a view on the specific interest of users and the states' goal of social welfare. In particular,the regulation of prices and profits is used, with the methods of a price cap, rate of return regulation (cost of service regulation), a sliding-scale regime (a hybrid of the first two), or direct state setting of prices, e.g. based oncosts of production (*Kirkpatrick* and *Parker* 2004: 11).

To regulate prices and profits effectively, the regulation body needs information on the revenues, the costs and the economic value of the firm's asset base – information, which in reality the firm will try to avoid to give to outsiders. Furthermore, it's in the interest of the enterprise to increase the costs, e.g. of raising capital or through inflation of capital investment needs, during regulatory reviews to get a better starting position, which may result in a form of "regulatory gaming" (*Kirkpatrick* and *Parker* 2004: 12). To regulate optimally, the regulatory body therefore has to establish rules and incentives allowing him to get correct information, and stimulating the enterprise to maximise efforts and to reduce costs. As it is relatively unlikely that this will happen in practice, the outcome of regulation remains in most cases the "second best solution" compared to competition.

Rate of return regulation forces the enterprise to charge the price that would result under competition, the price in these cases is equal to the firm's efficient costs of production plus a market-determined rate of return on capital employed. This regulation mode has the advantage of setting prices according to real costs, but an incentive to reduce costs is not inherent.

In the case of price cap regulation, a price limit is established, so that the enterprise can operate profitably as long as it is able to keep its costs below the (fixed) cap, and it can maximise its profit by reducing costs. Such behaviour may lead to prices exceeding costs, and therefore large profits, e.g. through quality reduction which is cost-effective. On the other hand, a price cap provides incentives for the enterprise to reduce production costs to an efficient level and therefore might increase efficiency.

Sliding-scale regulation, which can assure that consumers gain in the case of high profits, is "something of a compromise between rate of return regulation and a price cap and can be designed to be superior to both" (*Kirkpatrick* and *Parker* 2004: 19). In this regulatory regime, a price cap is fixed, so that the firm has the incentive to increase profits by lowering costs. If the profit exceeds a level agreed on before, prices are adjusted downwards (on the different regulation models more detailed see *Kirkpatrick* and *Parker* 2004; *Knieps* 2005[2]).

In table 1 assets and drawbacks for the outlined regulatory regimes (with a specific view on the needs of administration/regulatory body and users) are summarised; the terms "low", "medium" and "high" define a classification of one method compared to the other regulatory regimes, not an absolute classification compared to unregulated provision. A sound quantification of the pro and cons of a specific regulatory regime has to be conducted with a view on country characteristics and the sectoral structure.

Table 1: Regulation Regimes and Related Problems

	Rate of Return	Price Cap	Sliding Scale
Efficiency Incentives	low – incentives to inflate opex* and capex**	high – efficiency benefits retained by the firm until the next price review	medium – share of efficiency benefits passed quickly to consumers
Difficulty of Administration	low – requires monitoring of revenue and cost data to prevent inefficient expenditures, but the process is similar to that which occurs under state ownership	high – requires considerable financial and economic data that may be well beyond the ability of a regulatory office	medium – particularly need regular and reliable profit data
Threat of Regulatory Gaming	low – rate of return can be reset to cover the cost of capital annually, or even more frequently if necessary	high – inflating of cost of capital and opex* and capex** needs when the cap is set. Difficult to correct quickly later	medium – risk of hiding profits
Threat of Regulatory Capture	medium – frequent rate reviews may encourage capture	high – great benefits obtainable over a lengthy period if the price cap is too generous	low – higher profits are shared with consumers
Risk of Political and Social Rejection	low – prices set according to costs and therefore more likely to seem fair	high – excess profits or losses leading to share closure are both likely to be unacceptable	medium – share higher profits, but also losses

Source: *Kirkpatrick* and *Parker* 2004: 20-21
Comment: * Operational expenditure; ** Capital Expenditure

3.3. Water and Justice – Can the Private Sector Ensure Secure Access?

Access rights are often discussed as a crucial point when it comes to water privatisation or at least private sector involvement.

As water is necessary for human life (drinking and eating) and well-being (personal hygiene, washing, and leisure), and has a specific value for the development of a society, it is often said that access to water is a "human right". The consequence of this specific value of water, so the public opinion in many cases, is public provision of water supply to ensure access for all stakeholders or potential user groups. This argumentation often is backed by the reference to the outstanding value of water in religions and cultural traditions of many countries, which from the viewpoint of many people constitutes governmental provision of water (*Kluge* and *Scheele* 2008).

The underlying (political) goal, safe and affordable access to water infrastructure, is valid without any doubt.The arguments backing it, in the contrary, do not hold: Access for all users can be guaranteed by compulsory connection to the service –the private enterprise can be forced to provide the service, so that access rights can be guaranteed by the state, while the service is provided privately. If the user is not able to pay, governmental subsidies for water providers are an option to reduce the users' costs, or the user directly can be subsidised by grants. Furthermore, the fact that a good is necessary for life does not constitute free access – food is important for human life, too, but people have to pay for it.

So, public provision in this context cannot be seen as the only and best solution to guarantee the fair access to water, as it is assumed to be inefficient compared to private provision (see in detail *Rees* 1998: 5-6) – as welfare theory states, the most efficient way of provision should be adapted.

3.4 Policy Implications and Outlook

As safe and affordable access to water infrastructure is pivotal, and not guaranteed due to existing market failure, specific regulation is necessary to overcome these problems. Regulation in this context should be seen not as a fixed state, but as a bargaining process between the interest of enterprises, consumers and the states, in particular the regulatory body. The different models used to regulate (water) utilities all have specific assets and drawbacks, so that a distinct and uniform suggestion, which model to chose is almost impossible.

As empirical evidence demonstrates, some modes of regulation are used more often than others in specific environments, so that we can draw a specific picture of what regulation mode might be suitable for specific circumstances. As the administration of a price cap regulation is relatively complex (data access), it might be suitable only for cases when the regulatory body has a guaranteed access to the enterprises' data, e.g. by statutory reporting requirements. The inherent incentive to cut costs in this model might lead to quality reductions. Due to the legal framework which constrains such behaviour (e.g. through the existence of water quality laws), in most industrialised countries as the European Union this constraint does not seem to be as important, so that this model might be a good option on the first view. But the high risk of regulatory capture in this model makes it less suitable in an environment where strong and well-organised interest groups (user groups or oligopoly water companies) exist and the governmental institutions are weak. For multi-level states like federations the high number of interest groups on the different levels might make it complex to use, the government has to assure the compliance of the different stakeholders with the new regulatory regime when using this model. Additionally, there is some evidence that price cap generates more customer complaints about rising prices, compared toother regulation models (*Kirkpatrick* and *Parker* 2004: 29). Despite these limitations,price cap regulation is used for utility regulation in a large number of developing countries worldwide (*Guasch* 2001).

As the sliding-scale regulation can satisfy (to a certain extent) investors *and* consumers, this regulation model may be less prone to regulatory capture – an important point in particular in a political environment which is in a strong need for sector liberalisation and coined by strong interest groups and lobbying organisations (*Kirkpatrick* and *Parker* 2004: 21). This is the case in Germany and many other countries of the European Union, which have a strong civil society with specific demands for water regulation. Especially in federal states this model – with a traditionally broad range of water suppliers at the local level – might be of interest as the existence of a multi-level system might increase the number of interest groups or stakeholders involved.

To sum up, a "gold standard" of regulation does not exist, each country has to adopt that regulation model which seems to be suitable with a view on country and sector characteristics.

In general, only the monopolistic bottleneck should be object of regulation, so unbundling before privatisation is a necessary precondition to regulate efficiently and effectively. To avoid a circumvention of regulatory measures or regulatory capture, which may be more costly than the choice of a "wrong" regulatory regime itself, the regulatory body must be well-informed about the interest and potential counter-strategies of enterprises and interest groups.

Compliance with regulatory measures can be increased with a sound information strategy to the public *ex ante* and the use of control mechanisms once the regime has been established. It seems of crucial importance in this context, to use knowledge on the water sector and on the specific sector characteristics which is given at the local or regional level, e.g. in municipal authorities, and within the water companies. This does not mean "self regulation" in the closer sense, but an involvement of the different stakeholders.

Beyond this backdrop, for members of administrative bodies involved in the regulatory process, knowledge not only about different types of regulatory regimes, PPP contract types and benchmark prices is important, but also a sound knowledge of the structure of the water sector, the interest groups involved, formal and informal networks and so on. Only this know how allows to chose the appropriate regulatory regime with the best cost-benefit relationship, which not necessarily is the one the political decision makers will chose.

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[i] For reconstruction and refurbishment of the utilities, about 50 to 60 per cent of the total costs are charged, see BDEW (2010).

[ii] In theory, the contract duration comprises 3 to 30 years, depending of the investment sum and the parties' interest, even if it can under certain conditions be terminated untimely.