Forward Oriented Benchmarking

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Abstract
With the traditional Benchmarking approach, water prices cannot be discussed seriously. A forward oriented Benchmarking concept was developed in order to facilitate reliable price-analysis. Present and future revenues, investments and costs are considered. From different projects it can be concluded that most of the Swiss water and wastewater companies have sufficient revenues in order to operate and maintain their infrastructure in a sustainable way. Because the forward oriented Benchmarking concept leads to very important results, the corresponding financial and rehabilitation modules will be integrated into “common” Swiss Benchmarking projects in the future.

Keywords
Benchmarking, drinking water, water prices, water supply

INTRODUCTION

Traditionally benchmarking focuses on data from the past. Then consequences are derived from different data sets in order to improve processes or enterprises in the future. With this backwards oriented approach many topics of the water and wastewater industry can be discussed (Hug et al., 2002; Matos et al., 2003; Kappeler et al., 2003; Dechant et al., 2004; Wittig et al., 2004; Hirner and Merkel, 2005; Wichmann et al., 2005; Kappeler et al., 2006).

Due to the increase of public awareness relative to water prices, the water and wastewater companies are more often faced with discussions on too high costs. Therefore they have a vital interest in a correct comparison of their rates. Backwards oriented benchmarking does not deliver reliable information as a basis for serious discussions of fees. Future investments such as the substitution or rehabilitation of mains, pipes or water treatment facilities have to be taken into account as well.

Hence, a special forward oriented benchmarking concept was developed and applied in order to seriously discuss and evaluate the revenues of water and wastewater companies and the possible development of their financial structure in the future.

METHODS

The forward oriented Benchmarking concept consists of the following modules:

- Module 1: *register of assets*
- Module 2: *revenues*
- Module 3: *rehabilitation*
- Module 4: *financial calculations*

With module 1 all the necessary data of assets are collected. Typical assets of the water and wastewater companies are listed in Tab. 1 and Tab. 2 respectively.

Table 1: Assets of water companies (exemplary extraction)

assets	values	year of construction
mains: cast iron	2'537 m	1935
mains: cast iron	217 m	1936
mains: cast iron	553 m	1937
mains: ductile cast iron	1'138 m	1983
mains: ductile cast iron	744 m	1984
mains: ductile cast iron	55 m	1985
spring water facility A	1'600 l/min (max.)	1995
treatment plant B	30'000 $m^3_{capacity}$/d	1988
ground water pumping station C, construction	-	2001
ground water pumping station C, electromechanical equipment	6'000 l/min (capacity)	2001
pumping station D, construction	-	1965
pumping station D, electromechanical equipment	5'000 l/min (capacity)	1998
reservoir E	8'000 m^3	1985

Because future investments are often dominated by mains rehabilitation, composition and age of the distribution system have to be considered in detail. Hence, the distribution mains data are collected separately for cast iron, ductile cast iron, polyethylene and other materials. Together with the structural data, historical and replacement costs are needed as well. Because the historical value of a large part of the distribution mains are unknown, their historical and replacement costs are estimated on a specific replacement cost of CHF 750 per meter for all water companies.

About 70% of the Swiss sewers are made of concrete and about 50% have a diameter up to 300 mm. Hence, due to statistically poor diversity of the Swiss sewer systems, the sewer pipes are only differentiated according to age.

With module 2 all the present and future revenues of the water companies are collected as well as running costs and total present dept. The different revenues are collected as annual sums and then standardized with the amount of sold water. Investments in new assets such as additional groundwater pumping stations or treatment steps and

investments driven by other infrastructure projects such as road construction also can be integrated.

Table 2: Assets of wastewater companies (exemplary extraction)

assets	values	year of construction
pipes	560 m	1956
pipes	125 m	1957
pipes	43 m	1958
pumping station A, construction	-	1983
pumping station A, electromchanical equipment	3.6 $m^3_{capacity}/s$	1984
storm-water retention tank B	1'000 m^3	2005
wastewater treatment plant C, construction	40'000 $EW_{COD,120}$	1985
wastewater treatment plant C, electromechanical equipment	40'000 $EW_{COD,120}$	1985

In order to get failure predictions with similar risk levels for all water companies, the need for rehabilitation is simulated with a mathematical simulation model with typical survival rates (basis: Herz 1996, Herz 1999; own failure analyses of sewers) for each group of mains. For the rehabilitation forecast of the other relevant assets, standard utilization periods (svgw, 2009; VSA 1994) are used in module 3. Hence, the amount of money which is needed in the next few years can be predicted with the existing data.

With standard values for the other financial parameters such as interest or depreciation rates, the relevant financial indicators are calculated in module 4. All assets are depreciated linearly over the full period of utilization. Hence, all assets are activated during the period of use and replaced afterwards (Meyer, 2008).

RESULTS AND DISCUSSION

Water companies

The discounted present values of the estimated investments in the next 20 years are shown in Fig. 1 together with the planed investments by the water companies. Obviously, either not all the necessary investments are integrated into the plans of investigation or they only cover a relatively short period of time.

In Fig. 2 the discounted present values are differentiated between distribution mains and other assets. On average data it can be concluded that future investments in distribution mains are similar to the ones in other assets such as pumping stations and reservoirs.

As typical for decentralized organizations, the revenues of the Swiss Water companies differ a lot. For instance, the fraction of m^3-related charges varies between 30% and 80% of the total revenues (Fig. 3).

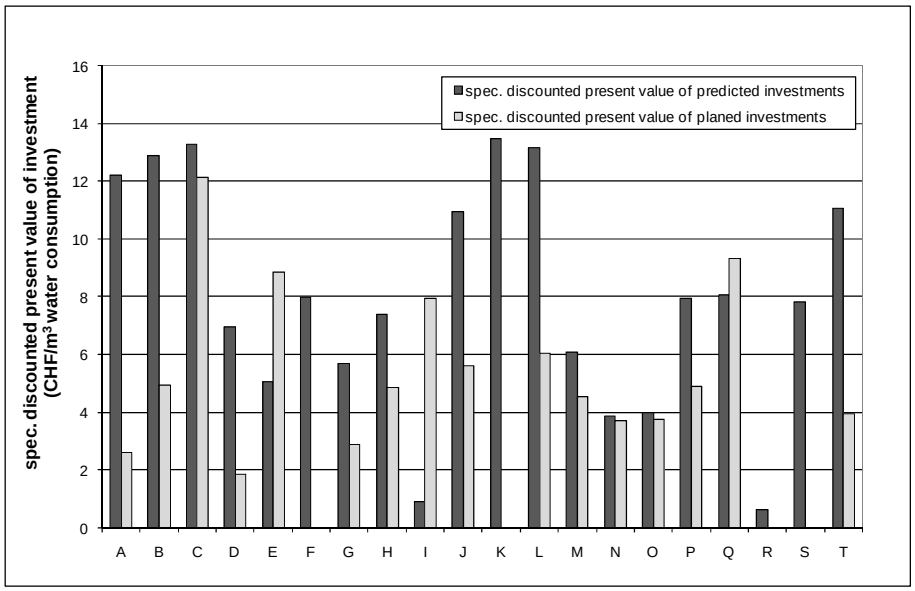

Figure 1: discounted present values of predicted and planed investments

From Fig. 4 it can be concluded that the degree of self-financing of Swiss water companies is generally high. Nevertheless the revenues of some water companies are not sufficient in the next few years, leading to a theoretically negative degree of self-financing. At the moment it is accepted that the degree of self-financing should not decrease 10% (SVGW, 2009). As a consequence of insufficient revenues, the interest expenses costs would rise up to CHF 2.00 per m^3 for the water companies with a poor degree of self-financing.

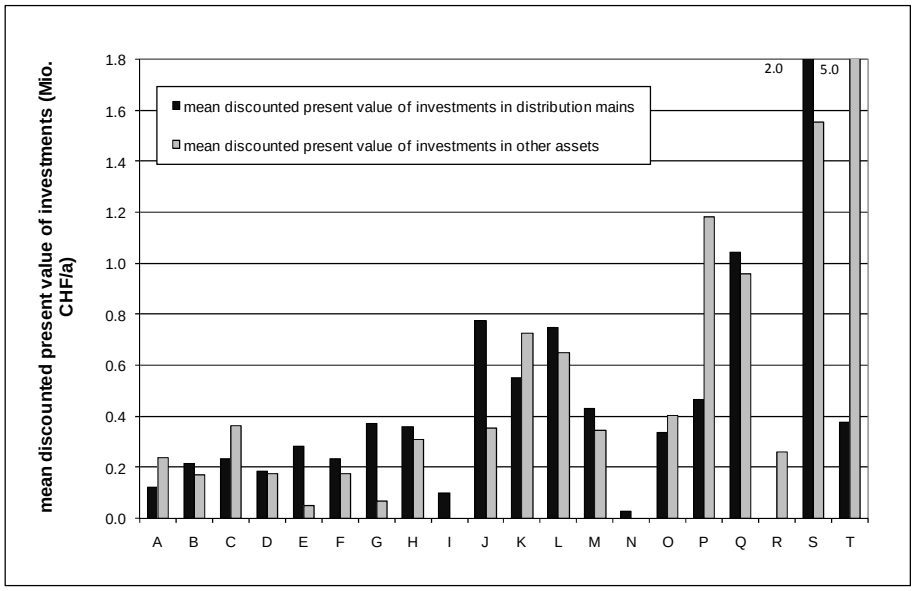

Figure 2: discounted present values of investments in distribution mains and other assets

With the existing data basis the course of the degree of self-financing can be estimated for the water companies over the next few years (Fig. 5). As a consequence of the Benchmarking project, some of the water companies with critical revenues will increase water prices in the future.

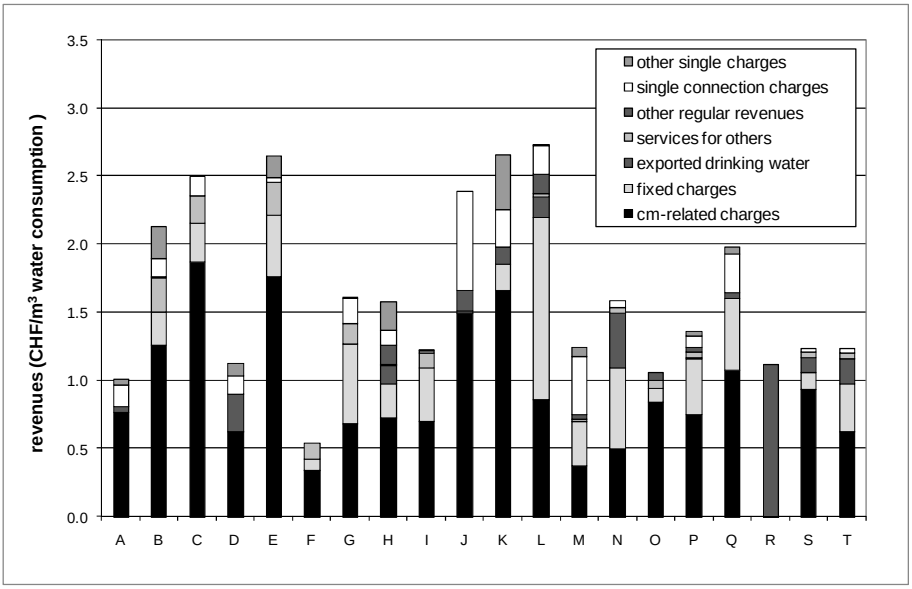

Figure 3: standardized revenues of the water companies

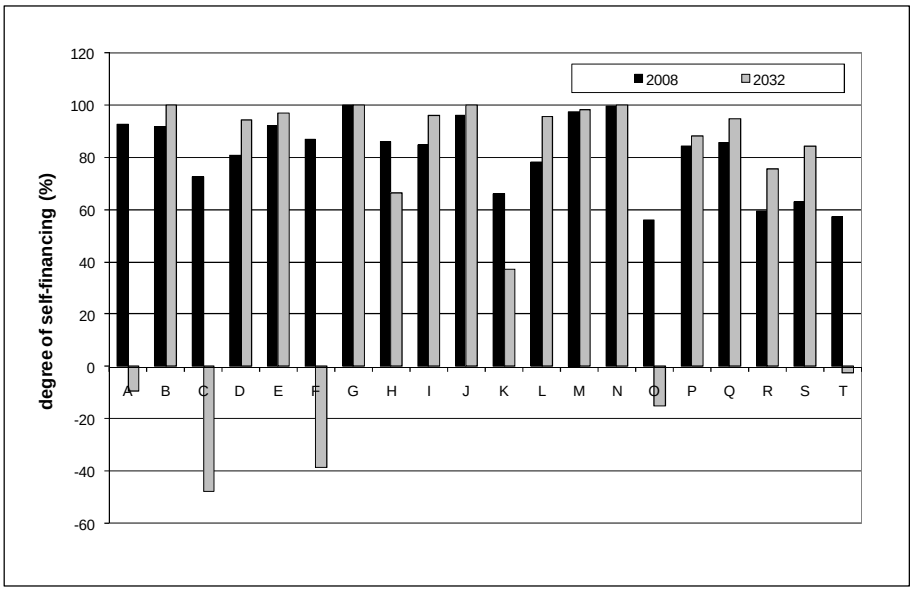

Figure 4: degree of self-financing

In Switzerland the total costs of the water companies are dominated by the transmission and distribution mains (Kappeler et al., 2009). Hence the specific transmission input per km distribution mains is the decisive factor of influence which links costs (dominated by the mains length) with revenues (at least indirectly dominated by the amount of sold water). From Fig. 6 it can be seen that the specific transmission input varies by a factor of 4 among the different water companies.

As a consequence, when discussing water prices both the effect on the future degree of self-financing and the most important specific transmission input have to be taken into account.

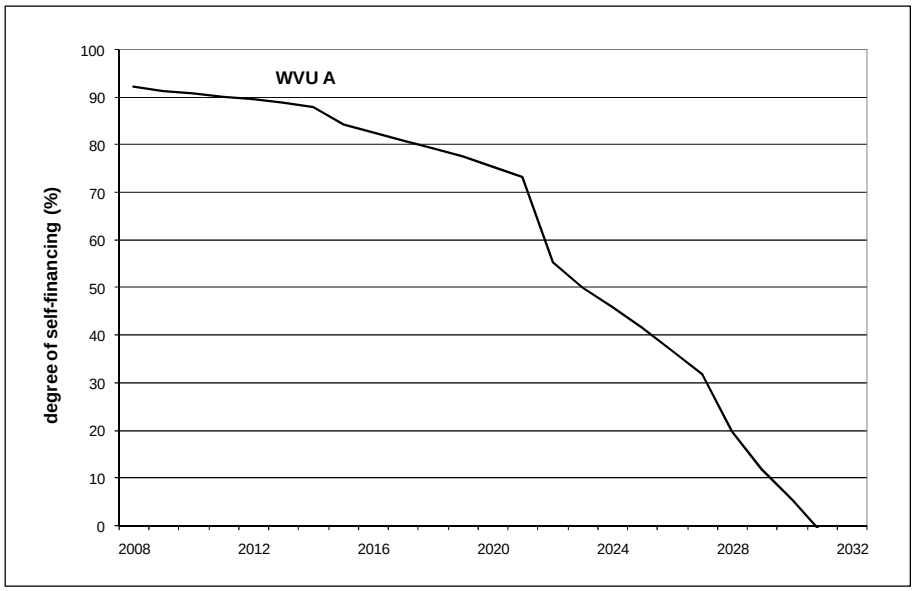

Figure 5: course of degree of self-financing of company A

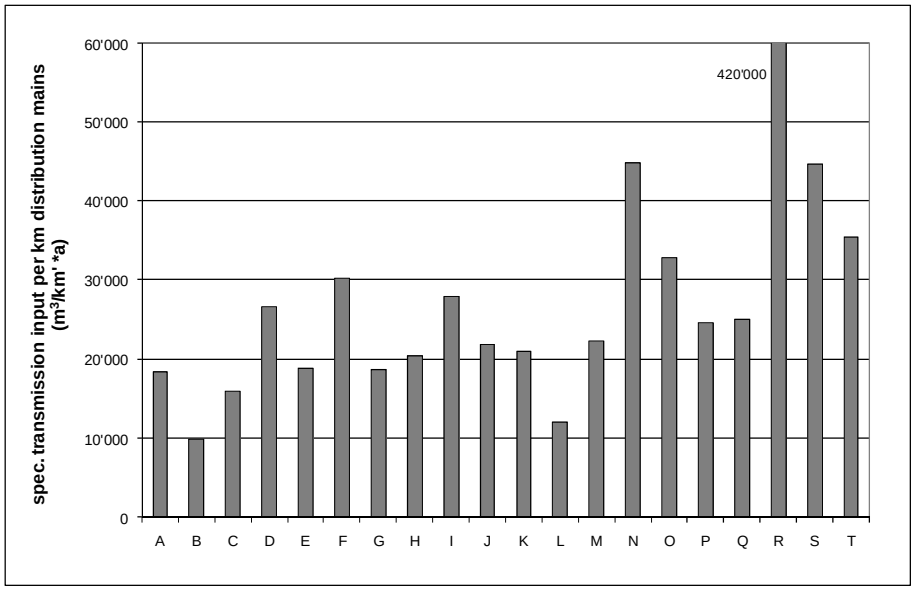

Figure 6: Specific transmission input per distribution mains length

In Switzerland the annual regular revenues should not exceed the sum of running costs, theoretically calculated depreciation costs (based on historical values of assets and real utilization periods) and effective interest expenses costs (Meyer, 2008). Fig. 7 shows that related to this upper limit some of the water companies have relatively high water rates.

Wastewater companies

The findings for Swiss wastewater companies are similar. From Fig. 8 it can be seen that the degree of self-financing normally is very high in Switzerland. Many companies will be able to self-finance all the future investments from their revenues.

Regarding the upper limit for the regular annual revenues, the wastewater rates also are relatively high (Fig. 9), corresponding to the degree of self-financing.

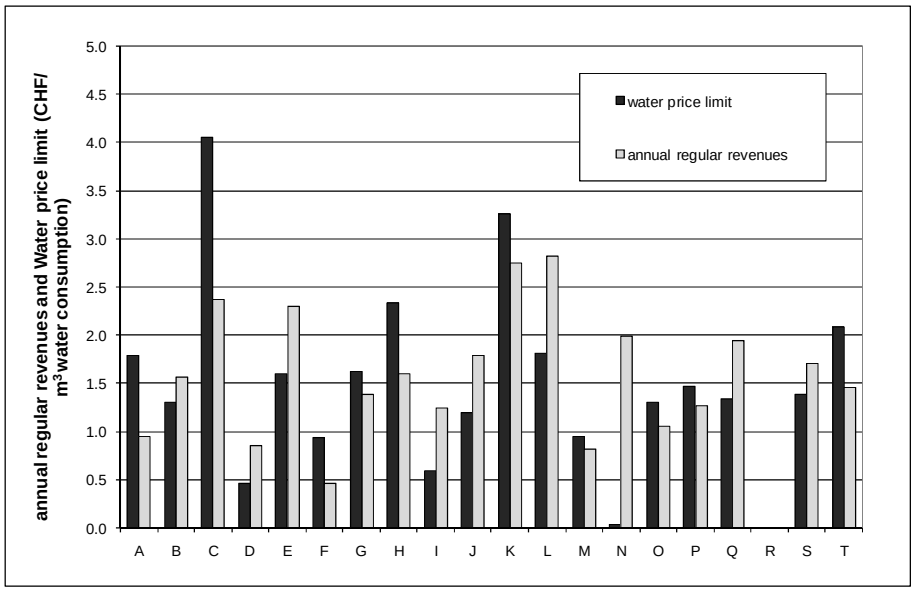

Figure 7: annual regular revenues and water price limit

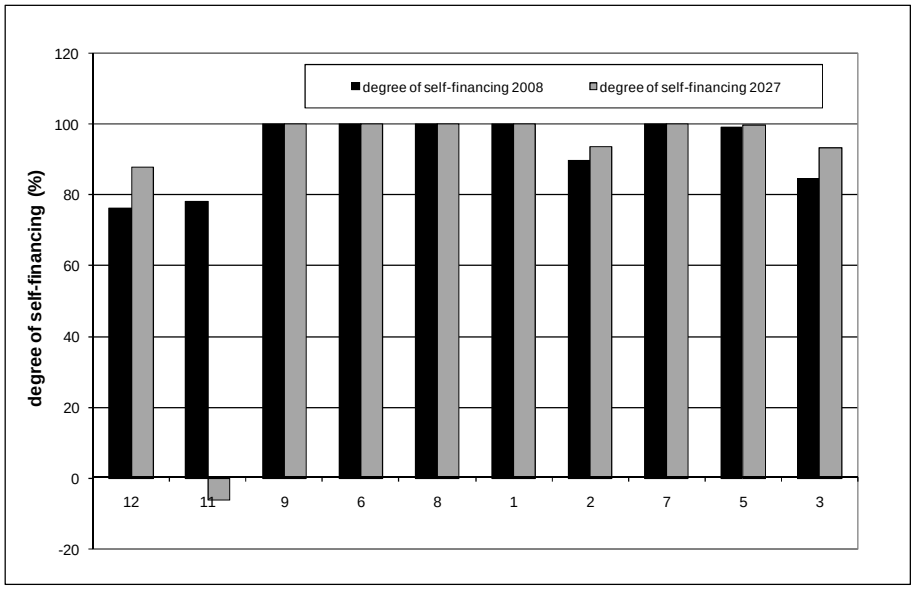

Figure 8: degree of self-financing

CONCLUSIONS

From the different projects it can be concluded that the revenues of 5 out of 20 water companies and 1 out of 10 wastewater companies are not sufficient in order to finance investments, interests and operation of the infrastructure in a sustainable way (degree of self-financing higher than 10%). On the other hand it resulted that about 50% of the water and wastewater companies claim relatively high fees. Generally the wastewater sector is better financed and most of the future investments will be self-financed.

The forward oriented benchmarking concept was applied in several Swiss benchmarking projects during the past few months. It has been proofed that the concept allows a serious discussion on water prices within the frame of benchmarking-projects. By the forward looking approach, benchmarking has become an even more powerful tool for water and wastewater companies.

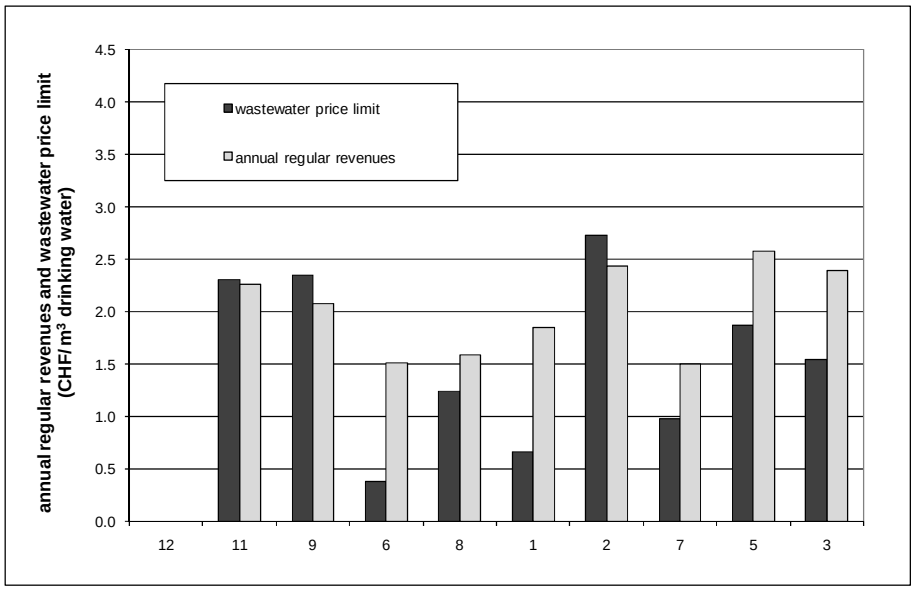

Figure 9: annual regular revenues and wastewater price limit

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