

European Comparison of Sewerage Charges

Summary

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**Research project No. 30/96 for the Federal Ministry of the Economic Affairs and the
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety**

December 1998

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Sewerage Charges: European Comparison

1 Introduction

International opinion holds Germany to be the country with the highest drinking water prices and sewerage charges. According to an assessment report by the World Bank, this phenomenon is attributable to excessive technological requirements and to the lack of cost-efficiency.

Consequently, a research project was commissioned by the German Federal Ministry of Economic Affairs in co-operation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety titled "European Comparison of Sewerage Charges" which was to make a comparison of costs and charges with selected other Member States of the EU as well as illustrate the reasons for structural price differences.

The Member States considered in this study are Denmark, Germany, France, Italy, Austria and Great Britain (England and Wales), whereby Germany constitutes the focal point. Germany's sewerage charges and the associated cost factors are thus examined here in more detail than those of the other states.

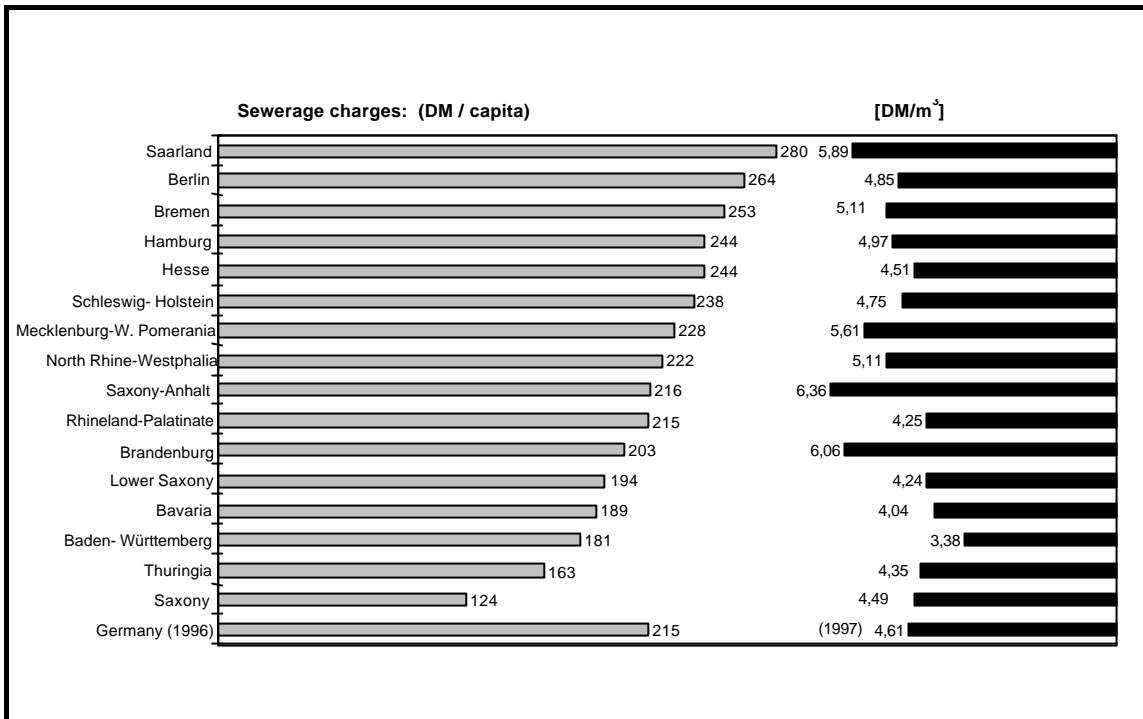
2 Sewerage Charges in Germany

In 1995 in Germany, around 72.5 million inhabitants (approximately 92% of the population), amounting to population equivalents of 117.4 million (including small commerce), were connected to sewage systems, producing 9.9 million cubic meters of sewage, which in turn was treated in 10,390 treatment plants, 88.6% of it biologically.

According to surveys done by the Federal Association of German Gas and Water Industries (*Bundesverband der Deutschen Gas- und Wasserwirtschaft* - BGW) and the latest information provided by the Association for Waste Water Technology (*Abwassertechnische Vereinigung* - ATV), the average sewerage charge per capita was DM 215 per annum (data as of 1996), or DM 4.61 per cubic meter of fresh water consumption (data as of 1997; see table 1). The most recent study done by the ATV in 1997 concluded a figure of DM 4.62 per cubic metre.

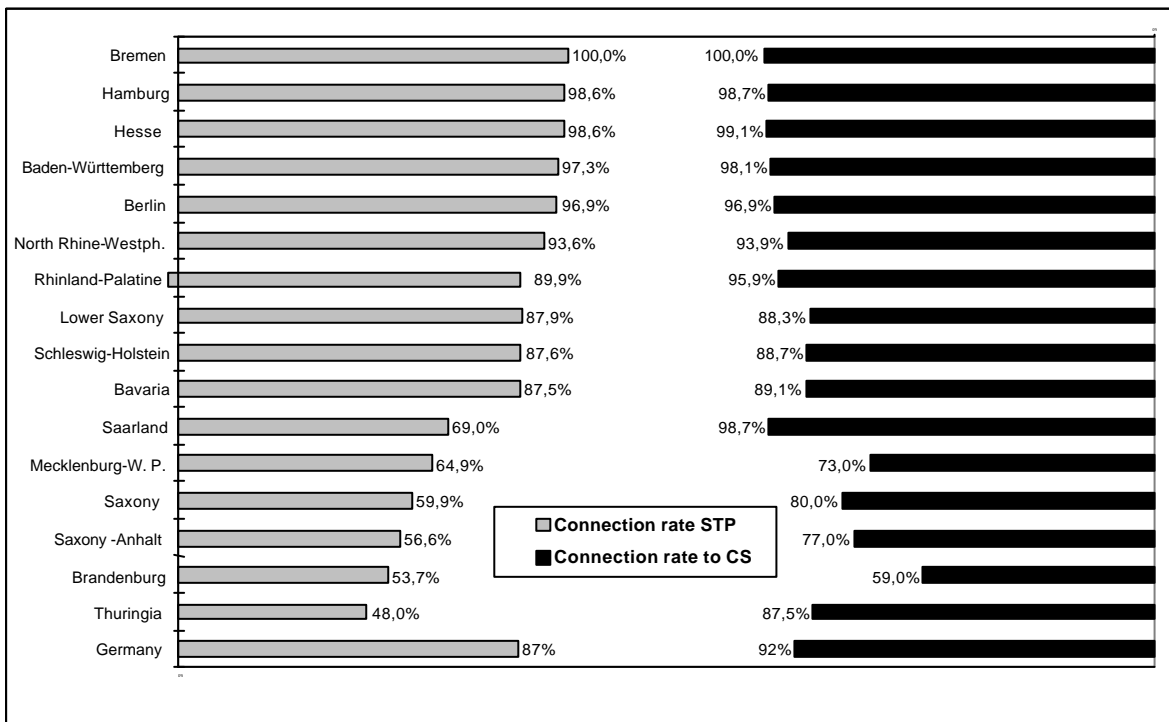
If one compares the extent to which households in the individual German Länder are connected to sewage treatment plants (see table 2) with the average sewerage charges, a general trend is visible, particularly when considering former East and West Germany separately: higher percentages of households/units connected correspond to higher charges (see table 3). Deviations from this trend can be attributed to various technical and statistical conditions.

Table 1: Average Sewerage Charges in the Federal Länder



DM per capita and annum; DM per cubic metre
 (ATV, 1997; BGW, 1998; "Wasser und Boden", July, 1998)

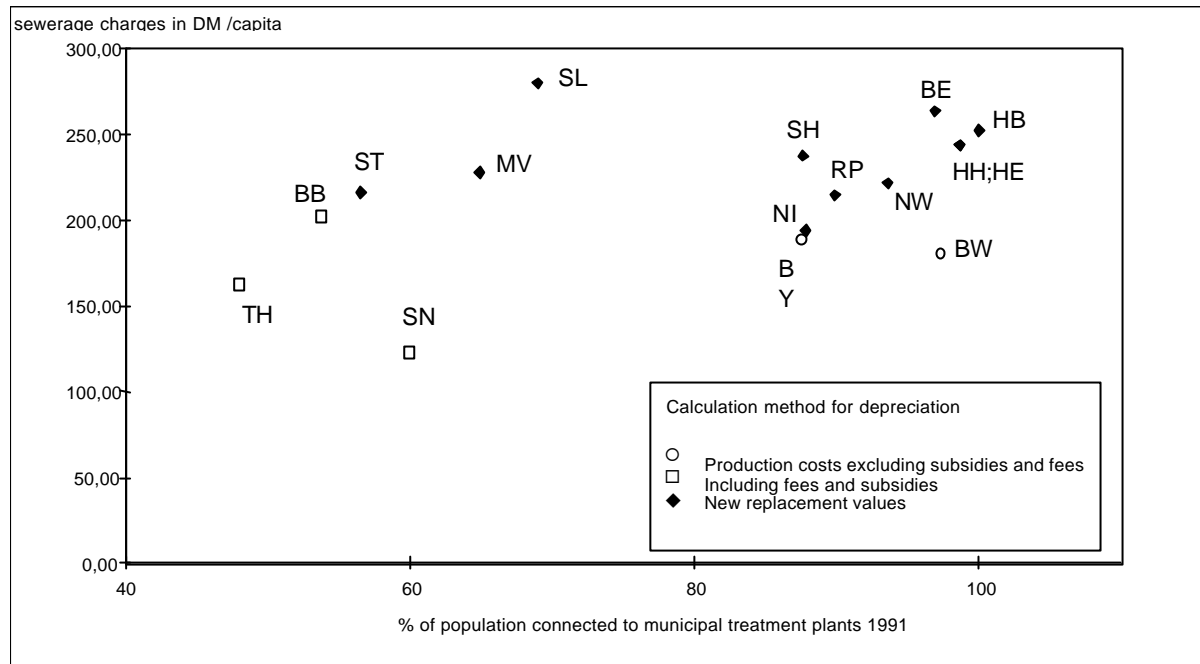
Table 2: Rate of population connected to sewers and sewage treatment plants



Figures in grey: percentage of population connected to sewage treatment plants (STP); figures in black: connection rates to collection systems (CS).

[STATISTISCHES BUNDESAMT, data 1995, partially updated]

Table 3: Percentage of connections to municipal treatment plants compared to average sewerage charges¹



In general municipalities are able to finance their investments in sewerage systems and operational costs through revenue from contributions and sewerage charges; a legal right to state or federal government subsidies does not exist. The collection of such contributions and charges is set in the Municipal Charges Laws (*Kommunalabgabengesetze* - KAG) of the various federal Länder on principle of cost-recovery: the revenues collected by a particular community may not exceed the actual costs of the sewerage services, and conversely, the charges should be set at such a level that no deficit arises (although in practice large cities, for example, might collect considerable surpluses while small communities with very high per capita costs might have large deficits).

In general a municipality is free to collect fixed contributions regularly, and in some Länder even basic monthly charges, in addition to the volume charges (DM per cubic metre, or in the case of rainwater DM per square metre). If such charges are not collected, an increase in the volume charges is generally the result, because a larger debt volume for the necessary investments must be carried. If, on the other hand, such charges are collected, the debt service decreases and the volumetric charges can remain lower. For this reason, the distinction between regular and volume charges must be calculated into any comparison. Subsidies from third parties (e.g. state or federal support for infrastructure) must also be taken into account, as it reduces municipal investment costs and in turn reduces sewerage charges.

Increasing population density -- as a measure of urbanisation growth -- does not in general correlate to lower charges. When considering the data for sewerage charges in district capital

¹ N.B. The two data groups do not correspond to the same year. The general conclusions are however

cities (*Kreisstädte*) in North Rhine-Westphalia, the charges climb proportionately with population density up to 2,000 inhabitants per square kilometre. In cities whose population density exceeds 2,000 per square kilometre, however, the charges drop as density increases. This fact shows that the sewerage charges are not directly determined by cost: because the latter is principally dependent on cost of capital, which in turn reflects primarily sewer construction, one would expect charges to be lower with less length of sewer per capita (metres per inhabitant), lower meter volume values (*Metermengenwert*: m³ of sewage per m of sewer per annum) or with lower population density. *Obviously there are factors other than direct cost which determine sewerage charges.*

The influence of technical standards among the collection systems and treatment plants on the sewerage charges is just as difficult to quantify. The standards for collection and treatment of sewage are defined in the DIN (*Deutsches Institut für Normung* - German Standards Institute) and ATV rules. Further legal parameters which cities and municipalities cannot influence are, for instance, "self-supervision rules" (*Eigenkontrollverordnungen*) or removal rates for treatment plants dependent on immission standards. If a treatment plant is legally required to be fitted with nitrogen elimination systems during expansion, it will be faced with greater investment costs. Generally, treatment plants facing such expansion often are being modernised at the same time (sometimes down to their office buildings), a tendency which increases the cost of such undertakings. Nonetheless, the costs for the more stringent treatment processes (including nitrogen and phosphorous elimination, without UV disinfecting) comprises only 6-7% of the total cost. *Lowering the treatment standards would hardly reduce sewerage charges.*

In recent years the unit prices for sewage treatment plants have been reduced due to a general downward trend in costs for construction and equipment, technological advancement, and the cost-cutting pressure of competition and rationalisation.

Further potential for limiting the continued increase in costs and charges for sewerage services can be found particularly in the conceptual phase of construction or expansion projects of sewerage installations. In addition, the 1996 amendment of the federal Water Management Act (*Wasserhaushaltsgesetz* - WHG) offers extensive relief (decentralisation; case-by-case limitations on the environmental impact assessment requirement (*Umweltverträglichkeitsprüfung* - UVP) on construction or major changes of treatment plants; Länder' introduction of procedural simplification for rainwater² collection and treatment; authorisation (*Ermächtigung*) for the Länder to delegate sewerage services completely to private enterprises).

Various organisational structures for sewerage services have emerged in the Federal Republic of Germany as a result of the *Länder* Water Laws. Sewage collection and treatment has traditionally been integrated in municipal administration, or has been independent only to a limited degree. Direct labours (*Regiebetriebe*) and Semi-autonomous municipal agencies (*Eigenbetriebe*) have been the classical organisational structures in the sewerage services

not impaired.

² Rain-water includes all water resulting from precipitation.

sector. The trend is a move away from municipal operations included in the general budget (*Regiebetrieb*) toward separate municipal entities which operate on their own clearly defined budgetary allotments (*Eigenbetrieb*); the former operational structure is now often considered obsolete.

Cities are increasingly gravitating toward forming private-law organisations (privatrechtliche Organisationsformen) to run their sewerage systems, and accordingly toward shifting the infrastructure and personnel off their own budgets. This is due to growing financial problems and to the fact that revenue surpluses are no longer so easy to produce in the sewerage sector. The greatest hindrance to this development, however, is the fact that private-law sewage operations are subject to taxation where public-law ones are not. 92% of municipalities with more than 100,000 inhabitants carrying large debt loads still operate public-law sewage operations.

Fair competition between municipal and private enterprises for public contracts (öffentliche Aufträge) can likely be reached only in the long-term, because the opportunities for municipal cross-subsidies are still too great, and municipal operators would have to create an appropriate, new accounting system before (Ewers, 1997). In the event that tax-status were equalised (*Entsorgungssteuerreform*), a trend towards privatisation in the sewerage services, presumably connected with more cost-efficiency could be expected.

3 Sewerage Charges in Selected Member States of the EU

3.1 Denmark

The demographic patterns in Denmark prove to be varied. On the one hand, around one quarter of the population lives in the Copenhagen metropolitan area, while on the other hand one third of the population live in towns and villages with less than 10,000 inhabitants. In many parts of Denmark the settlement patterns are such that connecting properties to a central sewage system would be impossible or impracticable. Approximately 77% of properties in Denmark are connected to treatment plants; 90.6% of these are municipally operated.³

Denmark is a country in which sewerage services are not exclusively carried out by municipal authorities, rather in which a considerable portion of the sector is dealt with privately by property owners or by neighbourhood community groups. But for the most part the municipalities are responsible: 277 municipalities and 14 districts are responsible for the construction and operation of the sewerage system. Since the 1970s, the municipalities have been required to design plans for sewage disposal and to finance them through municipal taxes and charges (self-finance). Sewerage services is to a large extent organised by direct labours, and therefore included in the general municipal budget.

Due to the generally slow progress in water resource protection, the government has demanded both a more strict application of the cost-recovering principle for capital and operational costs and an acceleration of investment in sewerage services since the 1980s.

The municipalities require a connection charge contribution to initial investment cost) and a charge for sewage collection and treatment, and are free to establish calculation methods for tariffs and charges (respecting the cost-recovering principle). In most municipalities the sewerage charge is volumetric, yet in 50-60% of households consumption is not measured and must be estimated.

The sewerage charges in Denmark amounted to an (unweighed) average of 13 Dkr per cubic metre (DM 3.42 per cubic metre). Costs for rainwater collection and treatment (as far as applied) are borne by the households.

A basic principle of financing the sewerage services in Denmark is that of economic neutrality or self-sufficiency (*Hvile-i-sig-selv*), and is comparable to the cost-recovering principle (*Kostendeckungsprinzip*) used in Germany. An important difference is the fact that costs and revenue may be balanced over several years, a phenomenon which allows deficits or reserves to accumulate, and in turn enables debt servicing.

The assets of the Danish collection system (including of rainwater collection) amount to around 200 thousand million Dkr or DM 52,3 thousand million reinstatement costs (Kragh, 1998, 17). This corresponds to 43,500 Dkr or DM 11,370 per capita among those connected to the sewer system.

No direct subsidies have been provided since the 1980s for the Danish sewerage system. Nonetheless, low-interest loans are given occasionally for investment in sewage collection improvements and replacement, though no details on the extent, conditions or economic results of such loans are known. Since 1989 Danish sewerage services are subject to the full Value Added Tax of 25% (*ibid.*, 27).

Presently the topic of sewerage services in thinly settled areas has entered public discussion. At debate is the question of whether additional costs between 20,000-30,000 Dkr (DM 5,200-7,800) per household lacking sufficient purification would be justified. Around 30-50% of households in rural areas would have to be newly connected to sewers (ca. 64,000 households).

3.2 France

The demographic structure of France's population is also characterised by two extremes: around 43.3% of the population lives in cities with more than 100,000 inhabitants, while around 27.8% lives in rural communities with less than 2,000 inhabitants. This figure grows to 43.8% when the communities with up to 10,000 inhabitants are counted.

In France, water supply and sewerage services are much more closely tied together than in Germany. One reason for this is the similarity in legal framework pertaining to both of these sectors.

³ The data in Denmark does not allow the calculation of connection rates of inhabitants to sewage treatment plants.

The fact that water supply and sewerage services are also financially connected is of particular importance in the context of an international comparison of sewerage charges. Water meters are customary in France, and as in Germany, the trend is moving away from measuring water consumption per property (i.e., per connection) toward measuring each apartment's (or household's) consumption. The standard for calculating sewerage charges is the consumption of fresh water. There are additionally special taxes and charges on water consumption which are in turn used as contributions to the sewerage services. Indeed, it is simply a French custom to speak of "water services" (*services de l'eau*) as an entity in which water supply, sewerage services and rainwater collection and treatment are included.

In France, the municipalities (approximately 36,500) are responsible for sewerage services, as in Germany. They either complete this task by means of their own municipal authorities, or delegation to private enterprises. In some cases, inter-municipal associations are entrusted with this project.

Municipal authorities are subject to the principle of cost recovery, and are not allowed to take in profits. They are also expected to include depreciation costs in the sewerage charges in order to at least finance replacements and improvements. Yet this provision is often ignored because the municipalities are not allowed to earn interest on these depreciations, but are instead required to deposit them (without interest) in the central government treasury. The formation of private-law enterprises by municipalities is forbidden in France.

As in Germany, in France there is also no regulatory authority specifically responsible for sewerage charges. The municipalities are obliged to set tariffs and charges themselves, as well as to fix delegations to private enterprises operators contractually. An oversight committee does exist in the event of contractual abuse, however, and is comprised of national governmental institutions.

In France there are sewerage charges, contributions to initial investment costs for connection to the sewage system (or connection charges), as well as increased charges for heavy polluters and reduced charges for entities producing sewage which is particularly inexpensive to treat. In addition there is a pollution charge (*redevance*) which is used to create the assets of the River Basin Agencies (*Agences de l'eau*), which in turn are used for water resource protection projects.

In 1996, the average yearly bill for consumption of 120 m³ of water amounted to 1,910 FF_r, including 974 FF_r for sewerage. Between 1992 and 1996 the sewerage charges rose by 90%, while the water price grew by only 31%. In examining these prices and charges for organisational dependency, one will notice that the privatised systems (or systems delegated to private enterprises) in 1996 were 16% more expensive (23% more expensive in 1991) than the systems operated by municipalities. Privatisation has generally taken place in mid-sized cities which carry higher per capita costs, and may be at a point in time when investments became necessary or when sewerage services became too expensive for the municipality. In addition, profit-seeking on the part of the private enterprises is seen as a further reason for the increase in charges.

The total value of capital (or asset) of the French sewerage system in terms of re-instatement costs (current costs) is estimated at 485 thousand million FFr or around DM 145 thousand million, which amounts to 15,638 FFr per capita (DM 4,638) among those connected to the sewer system.⁴ Presently the physical capital is not being sufficiently renewed or updated and threatens to become obsolete. This is the reason cited for the frequently pronounced demands for doubling the price of water in France, apparently the only way to raise the necessary funds.

The system of subsidies in France is also subject to considerable changes as a result of the decentralisation begun in the early 1980s. But even as the amount of self-financing among the parties responsible for sewerage services continues to grow, subsidies remain quite important. The cost of sewerage systems to the French economy in 1994 was 39 thousand million FFr; after calculating revenues of charges, subsidies still cover 46% of these costs; subsidies granted in the past are only partially included.

As in Germany, sewerage services in France are not generally subject to Value Added Tax (VAT). The municipalities, however, can choose to pay a reduced 5.5% (as opposed to 20.6%) value added tax on sewerage services and at the same time reclaim VAT paid on goods and services bought in.

The rainwater collection and treatment (as far as applied) is also a municipal responsibility in France. Resulting costs must be carried by the general municipal budgets, and may not be included in the calculation of sewerage charges; this is not the case in Germany.

The substantial recent increase in water prices and in sewerage charges has also been partly responsible for political conflicts, which themselves have become critical because of scandals regarding the delegation of water services to private contractors.

3.3 Italy

Whereas the French population is heavily concentrated in three large metropolitan areas (Paris, Lyon, Marseilles), the Italian population is rather evenly distributed in cities and communities of different size. Only around 25% of Italians live in cities with more than 100,000 inhabitants, and only 10% in communities with less than 2,000. Italy is particularly interesting for the European comparison because elements of the German organisational model -- municipal autonomy -- are mixed with those of the French system, and, to a lesser extent, with characteristics of the system in England and Wales.

Sewerage services in Italy are also a municipal responsibility, whereby one municipality often forms a consortium (*consortii*, similar to the German inter-municipal associations - *Zweckverbände*) with others, or with different district or regional authorities. Direct labour (management of the system under general municipal budgets) is no longer allowed according to the Italian law 142/1990, which categorises sewerage services as a commercial public service. Both, municipalities and consortia have the legal right to choose whether to undertake

⁴ An additional 330 thousand million FFr or approximately DM 100 thousand million in capital is estimated for water supply (Cambon and Berland, 1998, 8).

services themselves or to delegate it to private enterprises. In addition, they are also free to form municipal enterprises, inter-municipal companies or enterprises, public or mixed enterprises and to entrust them with the management of the sewerage services.

In the large cities there are private-law municipal which enterprises which manage the sewerage services either as separate entities or in conjunction with water supply or with waste management. In highly industrialised regions there are also corporate structures which resemble both the German Water and Soil Associations (*Wasser- und Bodenverbände*) and the Water Management Associations established by statute particular to the industrialised Ruhr region. These public-law associations in Italy are often the legal owners of the collection systems, while the operators are private-law contractors.

As of 1976 the principle of cost-recovery has been valid for Italian sewerage services, whereby debt-service is not included, but rather operational costs, maintenance and repair costs, and savings for investment in replacements or expansion.⁵ Various sources estimate that the "cost-recovery" only amounts to 30% of the total costs above, which means that not even the operational costs can be covered completely.

The assets of recently constructed treatment plants is not being properly maintained. Sewerage charges do not take depreciation into account, such that the sewerage operators receive no funds with which savings for improvements could be made. The result is that many municipalities make no effort to physically maintain the plants.

Although the clear intention of the Italian law 319/76 was to enforce the principle of cost-recovery, it has been made effectively powerless by the fact that sewerage charges are fixed nationally in budgetary law with no consideration given to cost structures. In 1997, the fixed ceiling on sewerage charges was 0.27 ECU per cubic metre, or DM 0.52 per cubic metre (Massarutto, 1998).

The total value of capital assets in the Italian sewerage systems is approximately 266 million million Lire, or DM 271 thousand million. With 47.5 million inhabitants connected to the sewer, the value per capita is approximately 5.6 million Lire, or DM 5,700.

As in France, rainwater collection and treatment in Italy is also a municipal responsibility, and is included in municipal budgets.

The greatest portion of sewage treatment plants in Italy is relatively new, constructed since 1976, and particularly since 1980. The construction funds were almost exclusively provided by the national or regional governments. Municipal budgets consist mainly of transfers from the national treasury and there are only limited means for municipalities to collect taxes and charges. These means are to be expanded currently to include, particularly, setting prices and charges for public services (including sewerage services).

⁵Only in the case of the largest plants is a small portion of debt-service costs covered by the sewerage charges

3.4 Austria

The Alps cover 60% of Austria's surface area, and 56.7% of the population lives in communities with less than 10,000 inhabitants. These facts help explain the comparatively low connection rates (only 75.7% of the population is connected to the sewer system) and higher sewerage charges in Austria. It is assumed that a potential connection rate of 85% is economically feasible. Due to Austria's geography, the connection rates vary quite noticeably from region to region.

Water in general is the responsibility of the federal Ministry of Agriculture and Forestry. However, the 99 districts are in charge of legal matters pertaining to water, and sewerage services is a municipal function. The Water Law allows for the formation of local water associations (*Wassergenossenschaften, WG* and *Wasserverbände, WV*) when these prove more effective in reaching objectives regarding water. Around one half of all municipalities is a member of such an association.

The structure of sewerage charges varies greatly even within the various Austrian Länder: the Styria alone has 29 different models. On the one hand, water meters are quite common, allowing a volumetric charging system. Yet on the other hand in Lower Austria (Niederösterreich), for example, the sewerage charges are based on the size of the home, not on water consumption. Under this circumstance, for instance, owners of vacation homes who may not regularly consume water nonetheless regularly pay for the fixed costs of sewerage services. There are also charging schemes based on the number of toilets in a home or on population equivalents. Industrial indirect emitters generally pay the same charges as households.

Government subsidies are intended to keep the sewerage charges per household below the politically significant level of 5,000 Austrian Shillings (ATS) per year (DM 710). The yearly costs for sewerage services per capita among connected households amounts to 2,210 ATS (approx. DM 319), while the average yearly charges amount to 2,144 ATS per capita (DM 304). Municipalities carry the cost of rainwater collection and treatment (as far as applied).

Using current replacement cost, the total capital in Austria's sewerage system was valued in 1991 at 364 thousand million ATS (DM 51.7 thousand million), of which 303.3 thousand million ATS is for the collection system and 60.1 thousand million for treatment plants. Thus, the value of the system per capita among connected households is approximately 60,000 ATS (DM 8,520).

Sewerage charges have not become a topic of public debate in Austria, likely because of the extent of subsidy coverage. Yet resistance to changes in the system is apparent, particularly on the part of industry.

3.5 Great Britain (England and Wales)

England and Wales have relatively small river basins, consisting of comparatively small, fast-running rivers, and the most important conurbation are located near river mouths or on the coast. For these reasons sewage treatment, at least on the coast, has had comparatively low priority. Sewage as well as sewage sludge were often dumped into the sea without treatment, a process which EU legislation will now end.

The municipalities in England and Wales are no longer responsible for sewerage services, an exception to the rule in the European Union. Ten private companies, some of which also supply water, have been entrusted with sewerage services since privatisation in 1989. Like France, Great Britain is a centralised country -- with respect to water supply and sewerage services quite particularly centralised. The main reason for this is the fact that even the judicial system is so strongly centralised in national authorities.

Price regulation for water supply and sewerage services in England and Wales is quite powerful and centralised in the Office for Water Services (OFWAT) which approves tariffs and charges. Disputes between OFWAT and the companies it regulates, as well as significant mergers between the latter, are mediated by the Monopolies and Mergers Commission, or at the highest level by the Minister of Commerce in his role as the head of the Board of Trade.

Alongside this economic regulation there is also that of the Environment Agency, which is responsible for water resource protection and supervises the discharge of treated sewage from treatment plants.

The principles of price regulation can be summarised as follows: the sewerage charges were politically fixed at the time of the 1989 privatisation at their then current level, in consideration of the new companies' need for funds and of their attractiveness in initial public offerings. The charges are now coupled to consumer inflation (retail price index)⁶; there is also a surcharge called the K-factor, which is meant to reflect the sewerage system's capital investment requirements. Thus, sewerage charges have grown faster than consumer prices in general. The individual water companies, however, are relatively free in setting prices, and can charge different regions or classes of customers differently, as long as they do not discriminate.

Water consumption is not measured in 92% of households in England and Wales; sewerage charges are then derived on the basis of the standardised property values used for taxation purposes (rateable values). The remaining 8% of the population pays volume-based sewerage charges. The weighted average annual charge for a single household in England and Wales was £118.5 in 1996-97, including the charge for rainwater collection and treatment. In 1995-96 sewerage charges amounted to 0.77% of private household expenditures.

The assets of sewerage installations in England and Wales on a Modern Equivalent Asset Base (MEA) were approximately £112 thousand million in 1996-97 (DM 296 thousand million), which corresponds to £2,226 per capita (DM 5,680).

The capital of the sewerage system, as well as that of the water supply system (an additional £50 thousand million, or DM 130 thousand million) was sold on the stock market in 1989 for the comparatively low price of £6.5 thousand million (approx. DM 17 thousand million). The purchasers (water companies) thus carry a debt-load which hardly approaches the capital value of the system. In addition, their own capitalisation after the market transactions also remains relatively small. Thus, the cost of capital, which also must be covered by the

⁶ RPI was chosen as a measure of inflation because it cannot be manipulated by the water industry and is also easy to understand for consumers.

sewerage charges, is minimal compared to what it would have been had the take-over price for the system resembled its actual capital value.

The sewerage charges in England and Wales are presently artificially low due to the transfer to private ownership of the system of a price of almost zero. This will change with time, however: as current treatment plants age and are replaced or improved, the resulting investment costs will have to be reflected in the sewerage charges. The charges will continue to climb in real terms. But because of the longevity of many treatment plants this process will take decades, assuming the current regulatory structure remains in effect.

Presently one must assume that the reserves built up through depreciation together with funds allotted for maintenance will not suffice for keeping the plants operational in the future.

The present discussion on the sewerage charges in England and Wales is divided. On the one hand, water supply seems to take priority over sewerage services in the public discussion. On the other hand, the private water companies are often in the political spotlight and the costs of sewerage services thus become a topic of debate. This was caused not only by the privatisation in 1989, but also by the latest election campaign, in which the windfall tax on the private water services companies was an issue.

4 International Comparison

The basis of comparison of sewerage charges in Europe is the average per capita charge among the portion of the population connected to the sewage system. In Europe, outside of Germany, data availability regarding total costs of sewerage services is often better than the data for average charges. Both data groups are shown together in Table 1.

Table 1: Sewerage charges and costs of selected Member States of the EU

	Germany	Denmark	France	Italy	Austria	England & Wales
Charges	215	183	134	50	304	129
Costs	361	268	247	133	314	147

(All figures in DM per capita among the population connected to collection systems)

One should take into consideration that the above comparison of data is effectively a juxtaposition of figures which are derived from very different methods of calculation and reflect varies technological standards. In Tables 2 and 3 the data reflect the following corrections:

- subsidies removed from calculation of sewerage charges (in the case of cost calculation, only the relevant considerations are included: federal effluent charge, *Abwasserabgabe*, in Germany, and privatisation in Great Britain;
- Value Added Tax not included;
- contributions to initial investment costs or comparable one-off payments included;
- specific sewage volumes (technical capacities) calculated according to the German standard;
- rainwater collection and treatment from private property included, public rainwater collection and treatment excluded.

Of the criteria which can be examined statistically, the connection rate to biological treatment plants comes closest to the current list of environmental demands, assuming one chooses a capacity-based criterion with no further differentiation for the overall comparison.

Were one to considers additional supporting data for the overall international comparison, Germany's sewerage charges (DM 215 per capita per annum) would represent the highest following only Austria (DM 304 per capita per annum) among those Member States analysed, and the percentage of water treated in biological treatment plants would be the highest. Important factors in Austria's data figures may be the topographical and geological circumstances -- impractical for the sewerage system -- the more rural population, the smaller organisational divisions and the lesser degree of privatisation compared to Germany.

When the data are corrected in the above manner, they help give an understanding of how the sewerage charges in the countries examined might appear given comparable general circumstances.

Table 2: Annual bills for sewerage services in EU member countries

	Germany	Denmark	France	Italy	Austria	England & Wales
Initial Figures	215	183	134	50	304	129
Correction factors						
• Subsidies	1,33	1,46	1,85	3,33	1,03	1,50
• VAT	0,94	0,93	0,95	0,93	0,93	
• Taxes and fiscal charges	1,02					1,14
• sewage quantities		0,97	0,97	0,88	0,95	0,98
• Rainwater	0,87					
Final figures	238	241	228	136	277	215

(All figures in DM per capita among the population connected to the sewer system)

Table 3: Annual costs sewerage services in the member countries

	Germany	Denmark	France	Italy	Austria	England & Wales
Initial figures	361	268	247	133	314	147
Correction factors						
• Subsidies	0,97					1,67
• VAT		0,93			0,93	
• Taxes and fiscal charges						
• sewage quantities	1,00	0,97	0,97	0,88	0,95	0,98
• Rainwater	0,87					
Final figures	305	241	239	117	277	244

(All figures in DM per capita among the population connected to the sewer system)

In Figures 4 and 5 the sewerage charges and costs for sewerage services are compared to connection rates

Figure 4: Comparison of sewerage charges to the connection rate to biological treatment plants

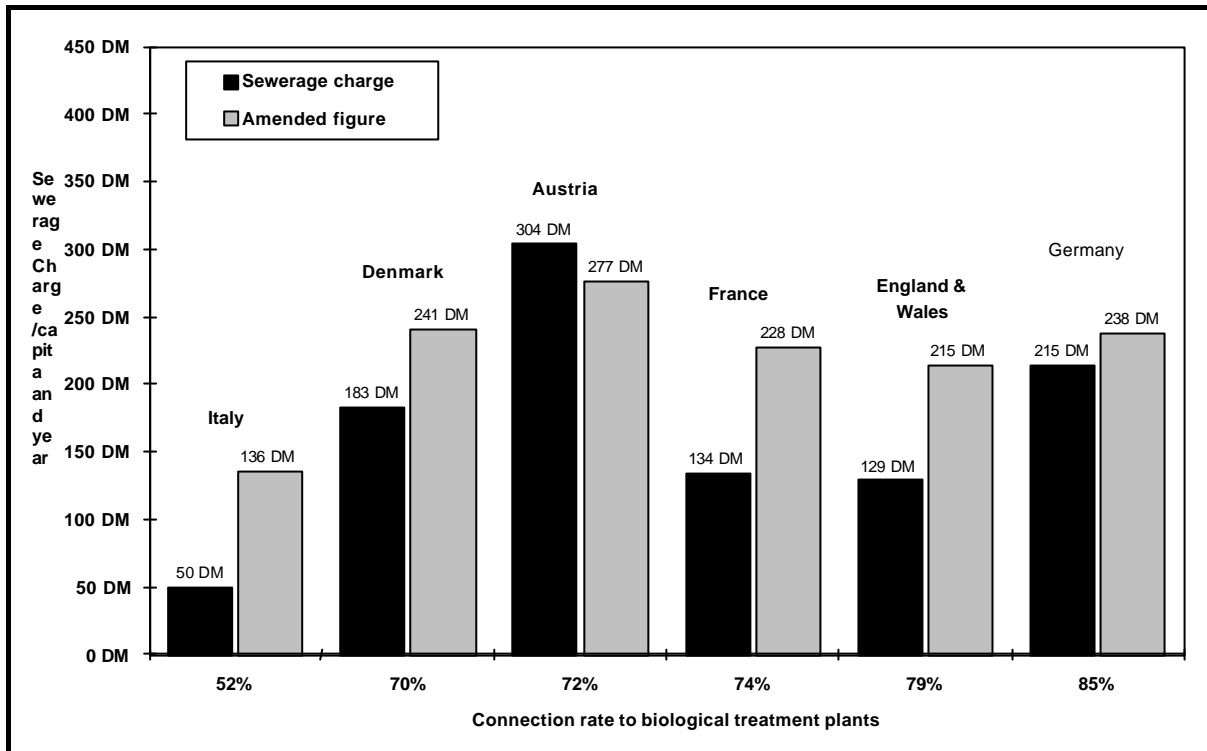
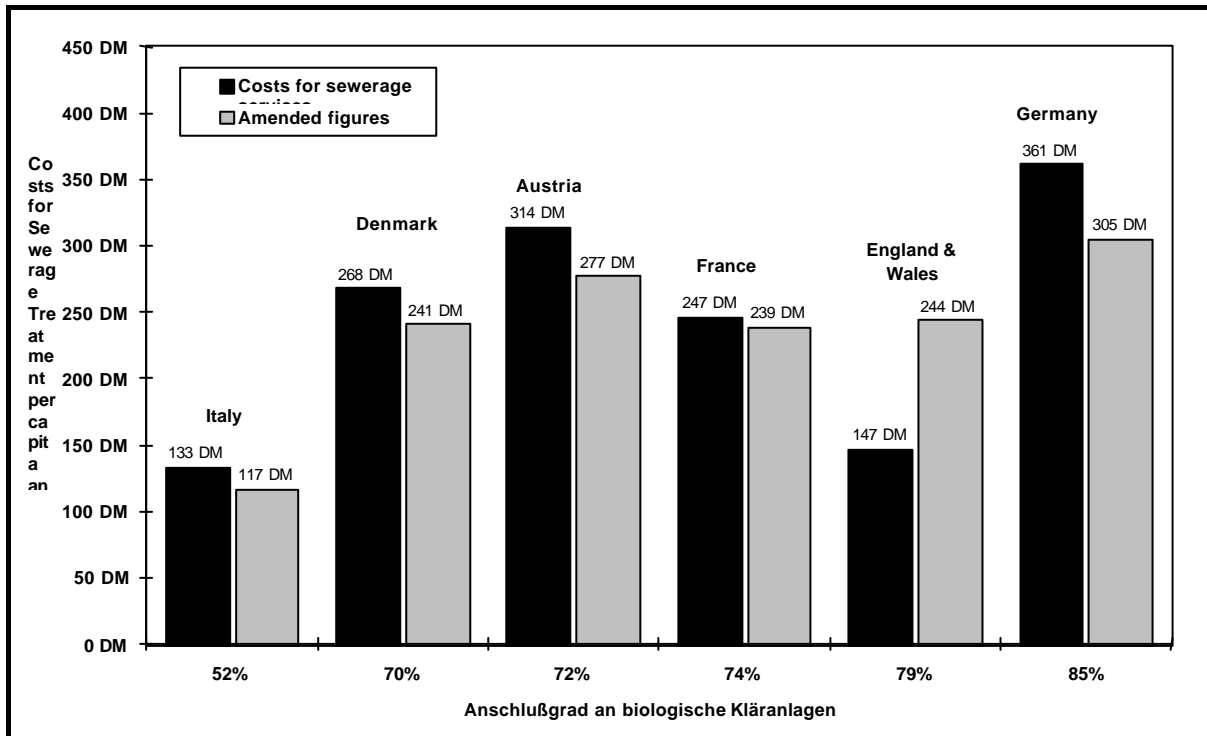


Figure 5: Comparison of sewerage costs to the connection rate to biological treatment plants



In England and Wales the lower sewerage charges are determined by the subsidy-like effects of the artificially low cost of privatisation, in which the private agents bought treatment plants under market price levels. The resulting charge-reducing effect is much greater than the influence of government subsidies on the charges in Germany.

In Germany and the other Member States of the EU, the sewerage charges do not directly reflect the actual cost structure, a result of government transfer payments. In Germany this is a result of government planning (which includes the intent to equalise living standards in urban and rural communities), but also of unintentional factors (for instance the frequent revenue surplus in large cities due to overly liberal calculation of sewerage charges).

In Table 4 the sewerage costs and charges are presented as a percentage of GNP in order to show the weight represented by sewerage charges relative to economic strength of the countries in question. The variables examined here are the "real" sewerage charges and the corrected cost figures.

Table 4: Sewerage charges and system costs compared with Gross National Product

	Italy	Denmark	Austria	France	England & Wales	Germany
% connected to biolog. Plants	52 %	70 %	72 %	74 %	79 %	85 %
GNP per capita	30.783	41.754	38.732	34.916	31.642	40.300
Real charges per capita (connected) p.a.	50	183	304	134	129	215
Real charges as % of GNP	0,16	0,44	0,75	0,38	0,41	0,53
Corrected costs per capita (connected) p.a.	117	241	277	239	244	305
Corrected costs as % of GNP	0,38	0,58	0,72	0,68	0,77	0,76

GNP p.c. 1994, figures in DM

5 Evaluation

The data presented confirm the generally accepted estimation: the statistically corrected sewerage charges and extrapolated sewerage costs put Germany at the front in the European comparison. The highest charges, though, are to be found in Austria. Germany is far and away the front runner in water resource protection compared to the other European countries, and also has the highest quotient of households connected to biological treatment plants. The very large difference annual bills concluded from the initial data values shrinks with statistical consideration (insofar as the database allows) of the different circumstances and industry capacities of the various countries.

Evaluation of the situation in Germany is presented in the following theses:

I. The sewerage charges do not correspond directly to the actual underlying cost structure.

The greatest cost component is the collection system. This fact would lead to the presumption that charges would rise in direct proportion with population density or with length of sewer per inhabitant. However, this is not the case.

II. The principle of cost-recovery has only limited efficacy in practice.

Larger cities have a tendency to generate sometimes large surpluses, particularly when the portion of revenues from the sewerage services designated for re-investment in the system (improvements, etc.) is not spent.

III. The "nutrient removal" does not drive substantial increases in charges.

According to available calculations, improvements in treatment standards (e.g. removal of nutrients) represent only about 6-7% of sewerage costs and on average 8% of sewerage charges.

IV. Sewerage charges are influenced by subsidies which often have unintended effects.

The most important transfers are the subsidies at the Länder level which have the direct effect of reducing sewerage charges. The advantage municipal sewerage operators are given in financing (municipal loans without risk financing) and in insurance (emergency funds for disaster or damages) keep the charges lower. On the other hand, there exists a federal effluent charge (*Abwasserabgabe*) which is being paid by the operator (discharger) to the government. The value added tax and corporate taxes are very influential on the comparison with the rest of Europe because they only affect privately operated enterprises. One result of these taxes is that joint operations between water supply and sewerage services are more prevalent in France or England than in Germany, where the system is dominated by public-law operators.

V. The sewerage system is subject to counter-productive incentives.

The government's compensation system offers no financial incentive toward the realisation of a cost-effective sewerage system. Generously calculated one-time investments are easier to justify and to carry-out than carefully considered and economical long-term plans.

VI. External cost control is not entirely effective.

Municipal regulatory authorities, budget offices (with their increasing activity in the water industry), and "cartel offices" (anti-trust commissions, insofar as they regulate the sewerage services) are in general only able to react to circumstances as they arise; they are lacking in executive responsibilities and in the quality and quantity of personnel. The result is a lack of overall supervision of efficiency in the sewerage services.

VII. The German sewerage system is technologically advanced.

Statistical data lead to the conclusion that higher connection rates, a stricter interpretation of environmental standards and more reliable discharge supervision are implemented in Germany than in France or England (particularly in contrast to the case of the England's rainwater collection and treatment and sewage sludge disposal).

VIII. The sewerage system is inflexible regarding technical standards.

This theory cannot be directly derived from the available data. Nonetheless, there can be little doubt that planners, government authorities and local or regional water associations are all inflexible in applying technical standards which are often costly and sometimes unnecessary.

IX. Growth rates of sewerage charges will decline in the future.

This can be concluded from the fact that the most costly new investments have been for the most part completed (especially in the metropolitan areas of former East Germany), and that future re-investment will be accompanied by more modern conceptualisation and radically lower construction costs.

In comparison to other European countries the following points are worthy of discussion:

X. Improvement in creating transparent financial reserves.

The cost-recovering principle is more flexibly applied in Denmark than in Germany or France. The Danish principle of financial neutrality (Hvile-i-sig-selv) calls for balancing municipal expenditures and revenues only on a long-term basis. Surpluses can be used for interest income and/or for re-investment of capital into the system and with this the creation of new debt can sometimes be avoided.

XI. Concession tax as a means of facilitating joint operations in the water industry

Introducing of a concession (licensing) tax on the sewerage services along with equalising the tax-status between the various branches of the water industry in Germany would simplify the integration of water supply and sewerage services into joint operations.

XII. Lack of acceptance of cost-recovering sewerage charges?

In Germany and other Member States of the EU, the acceptance of comparatively high sewerage charges has deteriorated of late, particularly in light of reports on mismanagement and inflated calculations of charges. In municipalities in Germany one often encounters the opinion that enough has been done for water resource protection, and that further efforts should be carried out by other cities in other European countries which have not yet done their share.

XIII. System transparency is lacking and therefore acceptance is low.

The degree to which information on expenditures and revenues in many parts of the sewerage services is made available is very low, especially when compared to other public services in Germany and the other countries examined here. This not only makes supervision of costs difficult, but also creates public mistrust of the parties involved.

XIV. External supervision of sewerage charges could be increased.

To apply the British model of a central authority for economic (or price) regulation in Germany would mean abolishing municipal self-administration and ending the responsibility of some ministries, and would mean transferring responsibilities from state to federal authorities. The

British system with its national centralisation is simply not applicable to Germany's federal structure, although certain individual elements might be of value.

XV. Facilitating private-law organisational structures.

Sewerage systems are organised quite differently in the various countries examined here (direct labour, semi-autonomous municipal agencies, inter-municipal associations, private enterprises,...). With the amendment to § 18a WHG, the German federal government allowed the Länder to give municipalities the option of delegating sewerage services to private-law operators (this option has been implemented in Saxony with Article 63 of the Saxony Water Act). For the most part, however, the Länder have made no use of this provision.

XVI. Equalising tax-status.

The inequality in tax-status between different operators in the sewerage services has meant that the "mature" sewerage systems in Germany (i.e. those that are fully constructed and have little near-term need for further investment) are a hindrance for forming private-law corporations. This leads to a distortion of competition between the various operational models.

The heavily discussed judgement of the Supreme Application Court (*BFH, Bundesfinanzgerichtshof*) VR 32/97 of 8 January 1998 denied application of the VAT because no distortion to competition was recognisable in the decisive legal case in 1993. Yet if tax-status were made uniform in both the water supply and sewerage services, the joint operation of both sectors would be made more feasible and would lead to greater potential for cost reduction.

XVII. Charges that cover costs are an incentive for efficient water use.

An increase in the amount of costs for sewerage services covered by charges in all Member States of the EU -- even to the extent that will be required by the future EU Water Framework Directive -- along with using volumetric charges, would represent a large step in improving the efficiency of water use in Europe. A reduction of government subsidies would also improve cost-efficiency in the sewerage services. In Germany costs are already comparatively well covered.

6 Summary

Compared to the other Member States of the European analysed, Austria, followed by Germany, has the highest sewerage charges per capita among households connected to collection systems, while in Germany the costs for sewerage services are highest. Yet with the highest connection rate to biological treatment plants, and in the implementation of the EU's legislation for water resource protection, Germany is the leader among the countries examined.

The differences in charges and costs between the Member States are not an extreme when the data are adjusted for different methods of calculation and for differences in the underlying systems: government subsidies are much higher in France than in Germany, English customers profit from privatisation (sewerage installations were sold for 4% of market value), while in Italy only 30% of system costs are reflected in charges.

In Germany and other Member States, sewerage charges are obviously determined by factors other than the actual system costs. There is no correlation between population density and sewerage charges, even though less length of sewer is required per capita in metropolitan areas and the charges are dominated by the cost of sewers. Large cities often profit from depreciations calculated using the new replacement value of capital.

The available data show quite clearly that in Germany less expenditures are made on maintenance or improvements of sewers than would be required in theory. The figures also show that toughened water resource protection standards have placed an additional load on the sewerage charges, yet that these refinements can only have accounted for 8% of the drastic increases of the past.

In the meantime much thought has been given to how sewerage costs and sewerage charges might be better controlled. A continued increase no longer appears to be acceptable from a socio-economic perspective, nor from the economic standpoint of industries which use large amounts of water. An analysis of the various factors and of the statistics indicates that no one single determining factor exists, but rather that many individual factors drive costs; this result might offer a starting point for further optimisation of the systems.

The organisational structure of the sewerage services is the source of many of the problems discussed above, for which reason its adaptation toward that of the German drinking water system should be considered.

The private-law organisation of the sewerage services would result in better accounting and also strengthen its legal status. Where the provision against sewerage charge surpluses to be interpreted more flexibly, as in the Danish model, temporary surpluses could be saved and invested by both public- and private-law organisations (provided they are required to use the funds for specific, known purposes). The drastic fluctuation (*Gebührensprung*) of sewerage charges could also be avoided in this manner.

The introduction of the value added tax on the sewerage services would be sensible. It would place more strict demands on accounting practices, which would in turn lead to advantages in competition, cost-supervision and management, and in general would be beneficial for the quality of economic statistics. Equilibrium of the tax-status in the water-supply (currently taxed at the reduced 7% level for living necessities) and sewerage services would also be ideal. In order to realise this goal it would be necessary to create transitional phases (perhaps even to allow the municipal authorities themselves to decide as in France), to allow operators to adapt to the new rules, as well as to create greater acceptance of them.

It remains to be discussed whether lifting the current mandatory connection to and utilisation of the sewerage system would lead to increased greater economic feasibility (e.g. where current connection costs are over DM 10,000 per capita and treatment costs are around DM 25 per cubic metre) and efficiency as expected, and what other consequences might possibly arise.

The transparency in the sector of sewerage services could be increased by means of benchmarking. By defining clear rules on the use of revenues, the destination of money derived from sewerage charges ("earmarking") would be more visible and a comparison of regionally varied

sewerage charge levels and service capacity would be possible. Acceptance of sewerage charges could be increased through publication of data from the sewerage operations, as long as the sewerage-charge levels remain explainable. In addition, bench-marking is a suitable way to discover inefficiencies because it allows ready comparison of data.

Nonetheless, pre-established planning objectives and experts' statements (Gutachten), etc. should be replaced by a competitive process of developing and selecting conceptual solutions, which would include advertising for candidates and greater acceptance of localised conditions.

Interest in such European comparisons of water price and sewerage charges is likely to grow with respect to the EU Water Framework Directive and the common currency. The European sewerage services operators will find themselves in a competitive process.