



VEWA

Comparison of European Water and Wastewater Prices

Study

civity Management Consultants GmbH & Co. KG

bdew

German Association of Energy
and Water Industries

civity Management
Consultants

Authors:

Friederike Lauruskus

Konstantin Meermann

Katja Bürger (research)

Heike Albrecht (layout and graphics)

civity Management Consultants GmbH & Co. KG

Oranienburger Strasse 5 · 10178 Berlin · Germany

Tel. +49 (0) 30 688 135 22-00 · Fax +49 (0) 30 688 135 22-49

info@civity.de · www.civity.de

Published by:

BDEW, German Association of Energy and Water Industries

Reinhardtstr. 32 · 10117 Berlin · Germany

Tel. +49 (0) 30 300 199-0 · Fax +49 (0) 30 300 199-3900

info@bdew.de · www.bdew.de

Contact person:

Attorney at Law, Dr Jörg Rehberg

Head of Water/Wastewater Division

Tel. +49 (0) 30 300199-1211

joerg.rehberg@bdew.de

Brussels Representative Office

Rue Breydel 34 · 1040 Brussels · Belgium

Tel. +32 (0) 2235019-0 · Fax +32 (0) 2235019-9

The work, including all its parts, is protected by copyright. Any exploitation hereof, which is not expressly permitted under the German Copyright Act, requires prior consent. This applies, in particular, in respect of acts of reproduction, adaptation, translation, microfilming as well as feeding in and processing in electronic systems.

3rd Edition, 2015.

Contents

Figures	5
Tables	8
1. Executive Summary	9
2. Introduction to the Methodology	21
2.1 Starting point and objective	21
2.2 Data collection and sources	23
2.3 Adjustment for purchasing power and price indexing	25
3. Structure of the Water Industry	27
3.1 Key macroeconomic data	27
3.1.1 Population structure	27
3.1.2 Income and price development	28
3.2 Regulatory policy framework of the countries	30
3.2.1 Number and size of companies	30
3.2.2 Forms of organisation	32
3.3 Water and wastewater volumes	35
3.3.1 Water sources and water abstraction	35
3.3.2 Water supplied and sewage	37
3.3.3 Wastewater treatment	40
4. Infrastructure and Investment	42
4.1 Infrastructure	42
4.1.1 Connection rate and treatment stages	42
4.1.2 Network lengths and water losses	47
4.1.3 Value of the infrastructure	51
4.2 Investments	55
4.2.1 Level of and development of investments	55
4.2.2 Investment and preservation of assets	64
5. Prices, Taxes, Levies and Grants	67
5.1 Calculation of prices	67
5.2 Taxes, levies and charges	72
5.3 Financing and grants	75
5.3.1 Financing with own and third party capital	75
5.3.2 Grants	77

6. Comparison of Water and Wastewater Prices	87
6.1 Analysis model	87
6.2 Water price comparison	88
6.2.1 Level I – country specific water price	88
6.2.2 Level II – cost recovery water price	90
6.2.3 Level III – water price at equal service levels	92
6.2.4 Summary of water price comparison	95
6.3 Wastewater price comparison	96
6.3.1 Level I – country specific wastewater price	96
6.3.2 Level II – cost recovery wastewater price	97
6.3.3 Level III – wastewater prices at equal service levels	99
6.3.4 Summary of wastewater price comparison	103
7. Quality and Customer Satisfaction	104
7.1 Water protection	104
7.1.1 Transposition of the Water Framework Directive into national law	105
7.1.2 Monitoring programmes of the Water Framework Directive	106
7.1.3 Management plans and programmes of measures in the countries in the comparison	107
7.2 Quality of the drinking water supply	113
7.2.1 Legal transposition of the Drinking Water Directive in the countries in the comparison	114
7.2.2 Meeting the requirements of drinking water quality	117
7.3 Quality of wastewater disposal	123
7.3.1 Proportion of sensitive areas	124
7.3.2 Compliance with wastewater collection requirements	125
7.3.3 Compliance with wastewater treatment requirements	126
7.3.4 Compliance with sewage sludge requirements	127
7.4 Customer service and customer satisfaction	129
7.4.1 Attitudes to water issues	129
7.4.2 Customer satisfaction	132
Conversation partners	135
List of Abbreviations	140
Bibliography	143

Figures

Fig. 1: Structural conditions for the price level in Germany.....	14
Fig. 2: Structural conditions for the price level in England/Wales	14
Fig. 3: Structural conditions for the price level in France	15
Fig. 4: Structural conditions for the price level in the Netherlands	15
Fig. 5: Structural conditions for the price level in Austria	16
Fig. 6: Structural conditions for the price level in Poland	16
Fig. 7: Total expenditure for water delivery	18
Fig. 8: Total expenditure for wastewater disposal	19
Fig. 9: Countries compared in the VEWA Study	22
Fig. 10: Development of purchasing power parities 1995 – 2012	26
Fig. 11: Number of residents and population density 2012.....	27
Fig. 12: Population structure 2012	28
Fig. 13: Change in Gross Domestic Product per capita 1995 – 2012	29
Fig. 14: Disposable income per capita 2012	29
Fig. 15: Volume of water abstracted for the public water supply 2012	36
Fig. 16: Volume of water supplied to households and small businesses 1995 – 2012.....	37
Fig. 17: Volume of sewage from households and small businesses 1995 – 2012	38
Fig. 18: Proportions of volume of water supplied and volume of sewage 2012.....	39
Fig. 19: Average water consumption and sewage volume per capita 2012.....	40
Fig. 20: Volume of wastewater treated 2012.....	41
Fig. 21: Rate of connection to public water supply and wastewater disposal 2012.....	43
Fig. 22: Change in rate of connection to treatment plants – Poland	44
Fig. 23: Purification stages in wastewater treatment 2012.....	45
Fig. 24: Nutrient emissions from treatment plants and sewers of the domestic sector 1990 – 2009..	46
Fig. 25: Length of the pipeline and sewer network 2012.....	47
Fig. 26: Length of the pipeline and sewer network per connected resident 2012.....	48
Fig. 27: Meter volume value from households and small businesses 2012.....	49
Fig. 28: Water losses (unmetered network supplies) 2012	50
Fig. 29: Specific water losses 2004 – 2012.....	51
Fig. 30: Value of the infrastructure of the water supply (pipeline network) 2012	53
Fig. 31: Value of the wastewater disposal infrastructure (sewer network) 2012.....	55

Fig. 32: Average investment for drinking water and wastewater 1995 – 2012	56
Fig. 33: Development of investment in Germany, 1995 – 2012	56
Fig. 34: Development of investment in England/Wales, 1995 – 2012.....	57
Fig. 35: Development of investment in France, 1995 – 2012.....	58
Fig. 36: Development of investment in the Netherlands 1995 – 2012	59
Fig. 37: Development of investment in Austria, 1995 – 2012.....	60
Fig. 38: Development of investment in Poland, 1995 – 2012.....	61
Fig. 39: Average investment per cubic metre 1995 – 2012.....	62
Fig. 40: Distribution of investment 1995 – 2012 in infrastructure	62
Fig. 41: Specific investment (1995 – 2012) and water prices	63
Fig. 42: Specific investment (1995 – 2012) and wastewater prices.....	63
Fig. 43: Renewal and expansion investment 1995 – 2012	64
Fig. 44: Calculation of the sustainability coefficient.....	65
Fig. 45: Sustainability coefficient for network renewal 2012	66
Fig. 46: Aid for drinking water and wastewater 2001 – 2012	77
Fig. 47: Specific aid for drinking water and wastewater 2001 – 2012.....	78
Fig. 48: Aid, Germany 2001 – 2012	79
Fig. 49: Grants, England/Wales 2001 – 2012	80
Fig. 50: Grant, France 2001 – 2012	81
Fig. 51: Grants, Netherlands 2001 – 2012	82
Fig. 52: Grants, France 2001 – 2012	83
Fig. 53: Grants, Poland 2001 – 2012	84
Fig. 54: Specific investment and grants in water supply 2003 – 2012	85
Fig. 55: Specific investment and grants in wastewater disposal 2003 – 2012.....	85
Fig. 56: Methodology of the study	88
Fig. 57: Level I – Country specific water price 2007 and 2012	89
Fig. 58: Change of water prices 2002 – 2012	90
Fig. 59: Level II – Cost recovery water price 2012.....	91
Fig. 60: Fees and grants from water supply	92
Fig. 61: Water prices and pipeline network quality.....	92
Fig. 62: Level III – Water prices at equal service levels 2012	94
Fig. 63: Level I – Country specific wastewater price 2007 and 2012.....	96
Fig. 64: Wastewater prices 2002 – 2012.....	97

Fig. 65: Level II – Cost recovery wastewater price 2012	98
Fig. 66: Fees and grants from wastewater disposal.....	99
Fig. 67: Wastewater price and proportion of wastewater treatment with tertiary treatment stage	100
Fig. 68: Level III – Wastewater prices at equal service levels 2012	102
Fig. 69: Monitoring of surface waters	106
Fig. 70: Monitoring of groundwater bodies	107
Fig. 71: Inventory – ecological status of rivers and lakes 2009.....	109
Fig. 72: Ecological status of surface waters 2009 and target 2015	109
Fig. 73: Inventory – heavily modified and artificial water bodies	110
Fig. 74: Chemical status of groundwater 2009 and target 2015	111
Fig. 75: Quantitative status of groundwater 2009 and target 2015	112
Fig. 76: Inventory – chemical status of the groundwater body.....	112
Fig. 77: Chemical status of groundwater 2009 and target 2015	113
Fig. 78: Compliance with limits according to parameter type and size of zone	119
Fig. 79: Microbiological and indicator parameters with limits exceeded	122
Fig. 80: Chemical parameters with limits exceeded.....	122
Fig. 81: The proportion of areas designated as sensitive	125
Fig. 82: Compliance with the provisions on wastewater collection	126
Fig. 83: Compliance with the provisions on secondary wastewater treatment	126
Fig. 84: Compliance with the provisions on more stringent wastewater treatment	127
Fig. 85: Sludge production in urban wastewater treatment plants 2010	128
Fig. 86: Disposal of sewage sludge from urban wastewater treatment plants 2010.....	128
Fig. 87: Attitudes of Europeans to water related issues (1 of 5)	130
Fig. 88: Attitudes of Europeans to water related issues (2 of 5)	130
Fig. 89: Attitudes of Europeans to water related issues (3 of 5)	131
Fig. 90: Attitudes of Europeans to water related issues (4 of 5)	131
Fig. 91: Attitudes of Europeans to water related issues (5 of 5)	132
Fig. 92: Satisfaction with the price of water supply 2006	133
Fig. 93: Satisfaction with the customer service of the water supply 2006.....	134
Fig. 94: Satisfaction with consumer protection in relation to water supply 2006.....	134

Tables

Table 1: Water prices level I – proportion of disposable income 2012	90
Table 2: Water prices level II – proportion of disposable income 2012	91
Table 3: Water prices level III – additional expenditure at equal service levels	93
Table 4: Water prices level III – proportion of disposable income 2012	94
Table 5: Water prices – comparison of levels I to III	95
Table 6: Water prices – comparison of expenditure per capita per annum levels I to III	95
Table 7: Water prices – proportion of disposable income, comparison of levels I to III	95
Table 8: Water prices – percentage change levels I to III	95
Table 9: Wastewater prices level I – proportion of disposable income 2012	97
Table 10: Wastewater prices level II – proportion of disposable income 2012	98
Table 11: Wastewater prices level III – additional cost at equal service levels	101
Table 12: Wastewater prices level III – proportion of disposable income 2012	102
Table 13: Wastewater prices – comparison of levels I to III	103
Table 14: Wastewater prices – comparison of expenditure per capita per annum levels I to III	103
Table 15: Wastewater prices – proportion of disposable income, levels I to III in comparison	103
Table 16: Wastewater prices – percentage change levels I to III	103

1. Executive Summary

Water supply and wastewater disposal systems are very different across the EU member states. Differences can be observed in the water industry's structure, infrastructures and investments, prices, grants, taxes and fees as well as standards of service and quality.

Nonetheless, there are standards and requirements set on a European level concerning the access to high quality, safe and sufficient drinking water as well as the protection of the environment from the adverse effects of urban wastewater discharges. So the water sector is the only economic sector in Europe for which EU directives lay down rules on the quality of services and on pricing with the objective of the recovery of costs.

Against this background, comparisons of water and wastewater prices must take more into account than mere cubic metre prices. This study delivers a systematic approach by not only describing but also quantifying and integrating grants and quality of services into the price comparison.

This study compares the water supply and wastewater disposal systems in Germany, England/Wales, France, the Netherlands, Austria and Poland covering slightly over half of the population of the EU-28. In the course of the study, the comparison leads to differentiated conclusions regarding the extent to which prices are cost-covering and what level of service and quality is achieved with them (on the objectives and methodology, see Sec. 2).

Structure of the water industry

The countries differ greatly in terms of their **population structure** (see Sec. 3.1.1). Germany is the most populous of the countries in the comparison, with 80 million residents, followed by France (63m), England/Wales (56m), Poland (39m), the Netherlands (17m) and Austria (8m). In England/Wales and in the Netherlands, the population density is three to four times that of France, Austria and Poland. In this respect, Germany lies in the middle of the field. This is underlined by the proportion of the population living in rural areas, which is between 30 and 40% in France, Austria and Poland. These factors, together with the connection rate, essentially determine the length of the pipeline network required per connected resident but also the costs of laying pipes per metre of network.

The **regulatory policy framework** (see Sec. 3.2) is as follows in the countries concerned: the legislative competence is on a European and national level (in Germany and Austria also on the level of the Länder (federal states)). In general, the implementation of water legislation is decentralised; only in England/Wales are just three central bodies responsible. For the organisation of the water supply and wastewater disposal, it is usually the municipalities (or in the Netherlands, the provinces) which are responsible; in England/Wales, the municipalities have not been involved since privatisation.

Accordingly, there are substantial differences in the **delivery** of the supply and disposal. Within Germany, Austria and Poland there are high numbers of small providers with just a few larger entities. In France, the organisation is at the local authority level, with 35,000 so-called services publics, which mostly employ operational management companies whilst making investments themselves. In contrast, the delivery in England/Wales is largely performed by ten major water and wastewater companies, which are predominantly in the hands of institutional investors. In the Netherlands, the delivery in terms of the water supply is also concentrated among ten suppliers, however these are owned by the municipalities. The delivery in terms of wastewater collection is performed by the local authorities or their operators, whilst water authorities perform the wastewater treatment supralocally.

Water and wastewater volumes

In Germany, France, the Netherlands and Poland, **water abstraction** (see Sec. 3.3.1) is performed mainly from groundwater (around two thirds in each case) whilst in Austria it is from groundwater and spring water. In England/Wales, however, drinking water is produced mainly from surface water.

The **water extracted** in Germany, England/Wales and France amounts to 5 to 6bn m³ per year; in the remaining countries, this figure is between 0.8 and 2.0bn m³. In England/Wales and Austria, this amounts to an extracted volume per resident in excess of 100 m³, next is France with 85 m³, followed by the Netherlands at 73 m³, Germany at 63 m³ and Poland at 60 m³. The differences in the volumes of water extracted can be attributed primarily to consumption behaviour as well as water losses in the pipeline network.

The proportion of the **water supplied** which is accounted for by households and small businesses lies between 73% (England/Wales, Netherlands and Austria) and 80% (Germany and Poland); only France lies significantly outside this range at 89% (see Sec. 3.3.2). The proportion of the overall costs borne by households and small businesses correlates with the proportion of water supplied to households and small businesses (i.e. the smaller the proportion of supply going to industry and others).

There are also marked differences in consumption behaviour. Whilst England/Wales and France, with consumption levels exceeding 150 litres per head per day, exhibit the highest average **water usage**, the equivalent figure for Austria (137 litres), the Netherlands (128 litres) and Germany (122 litres) is much lower. Poland has the lowest figure, at 98 litres per head per day. A greater per head usage tends to lead to smaller cubic metre prices due to the high proportion of fixed costs associated with water supply and wastewater disposal; however, the greater usage is then reflected in the cost per head.

The **volume of sewage** from households and small businesses is between 2.6 and 3.0bn m³ per year in Germany, England/Wales and France, around 0.9bn m³ in the Netherlands and Poland and 0.4bn m³ in Austria. In addition to that, a large part of the overall sewage comes from industry and other areas, especially in Germany and Austria, where the proportion is 38% and 43% respectively. In the Netherlands and Poland, the proportion is just under 30%, in France it is under 18% and in England/Wales it is at 7%.

That results in **wastewater treatment volumes** (see Sec. 3.3.3) of 9bn m³ in Germany, 6.6bn m³ in France and 1.1 to 2.0bn m³ in Austria, Poland and the Netherlands. No figures are available for England/Wales.

Infrastructure and investment

The **connection rate** in respect of the public **drinking water supply** is almost 100% in Germany, England/Wales, France and the Netherlands, whilst in Austria and Poland it is around 90% (see Sec. 4.1.1).

The **length of the pipeline network** (see Sec. 4.1.2) differs greatly as a result of the respective population numbers and settlement structures. The pipeline network in Germany is, at a length of 550,000 km, considerably longer than that of England/Wales (344,000) and the Netherlands, however its specific network length of 6.2 to 7.1 m per connected resident is comparable. In contrast, France has a pipeline network measuring 1.05 million km, which corresponds to 16.8 metres per resident. Austria and Poland have very widely spread settlements in rural areas. This leads to a higher specific pipeline

length per resident (10.0 and 8.7 metres respectively) in these countries than in the countries with almost 100% connection rate respectively.

The **connection rate** to the public **wastewater collection system** (see Sec. 4.1.1) is almost 100% in the Netherlands, 97% in Germany and England/Wales, 95% in France and in Austria whilst the rate in Poland (after a considerable increase) is 64%. The connection rate to treatment plants is almost identical to the connection rate to the wastewater collection system (with the exception of France).

The **length of the sewer network** (see Sec. 4.1.2) is substantially greater in Germany, at 560,000 km, than in England/Wales (320,000 km), France (370,000 km), the Netherlands, Poland and Austria. The corresponding specific sewer network lengths are comparable to one another as they all lie between 5 and 7 metres per connected resident, with only Austria as an exception, for which the figure is over 11 metres.

As far as **wastewater treatment** is concerned, there are considerable differences. Whilst Germany, the Netherlands and Austria subject 98% of the volume of relevant wastewater to a three-stage treatment, the equivalent levels in England/Wales (after a slight increase since 2007) and France are just 50%. In Poland, the proportion of the wastewater treated which includes a third treatment stage has more than doubled since 2007 to reach its current level of 84%.

To what extent the **quality** of wastewater treatment has improved over time is shown in an EEA study, which reveals a 50% reduction in nitrogen discharge and a 50 – 70% reduction in phosphorous discharge from treatment plants and sewers for the household sector in Germany, the Netherlands and Austria between 1990 and 2009. For the United Kingdom and France, no data is available in that study and for Poland part of the time series is missing.

Water loss (see Sec. 4.1.2) is a key indicator of the quality of the pipeline network and the security of supply. Germany and the Netherlands have the lowest levels of water loss, at 7% and almost 9% respectively. The level for Austria is estimated at 10 to 12%. In contrast, in England/Wales, France and Poland, between 20 and 24% of the water available does not arrive at the consumer. In absolute terms, that represents water losses for England/Wales and France of 1.3 and 1.1 billion m³ respectively and for Poland, although less, still of 0.5 billion m³.

For France and Poland the rate of loss is less severe in relation to the length of the network. The specific water loss per kilometre of pipeline per hour range from 0.12 m³ in Germany and Austria, 0.14 m³ in the Netherlands and 0.15 m³ in France, to 0.19 m³ in Poland. Today, England/Wales, however, experiences water loss at 0.50 m³ (compared to 0.69 m³ in 2005) per kilometre of pipeline. The targets set by the British regulatory authority on the state of the infrastructure have led to improvements; nevertheless, its condition remains markedly beneath that of the other countries in the comparison.

As the costs¹ of distribution account for a large part of the total costs of the water supply, the costs of laying pipes substantially determine water prices. In this area, there are large differences. The **asset value of the pipeline network** (adjusted for purchasing power) in the Netherlands is around €90 per metre, in France it is almost €140, in Austria €200, in Germany €220, in Poland €300 and in England/Wales €328. Extrapolated from this, the values of the entire pipeline networks at replacement

¹ In this study, all monetary amounts have been indexed to 2012 and adjusted according to German purchasing power levels.

cost are over €110bn for Germany, England/Wales and France; in Poland, the value is at €90bn, in Austria €16bn and in the Netherlands (where around half of the pipeline network today is PVC), the value is €11bn (see Sec. 4.1.3).

Laying costs for the sewer network do not exhibit – with the exception of France – such a wide range; they are between €560 and €710 per meter. Extrapolating from those numbers, the **asset values for the sewer network** at replacement cost are: Germany around €400bn, England/Wales €200bn, France €120bn, the Netherlands €80bn, Poland €70bn and Austria €60bn.

The **total investment** (see Sec. 4.2.1.) in infrastructure for drinking water supply and wastewater disposal is considerable in all of the countries in the comparison. On average for the years 1995 to 2012 (adjusted for purchasing power and price indexed), the amounts were as follows: €8.8bn in Germany, €6.9bn in England/Wales, €6.0bn in France, €3.7bn in Poland, €1.8bn in the Netherlands and €1.0bn in Austria. In the Netherlands, the investment is relatively stable whilst in Germany, England/Wales and Austria, the amounts have been decreasing in recent years. In France, an increase in investment in the wastewater infrastructure has been observed. In Poland, the level of investment fluctuates widely, displaying a decreasing trend in recent times.

As far as water supplied is concerned, **investment in drinking water supply** differs between the countries by as much as a factor of 2. Whilst England/Wales invests €0.78 per m³, Poland €0.70 per m³ and Germany €0.59 per m³, in France and the Netherlands it is around €0.50 per m³ and in Austria just €0.36 per m³. Around two thirds of that sum goes into (with the exception of the Netherlands) the pipeline networks in all of the countries in the comparison.

A different picture is observed in respect of **investment in wastewater disposal**. In this context, Poland leads the field (price indexed and adjusted for purchasing power) with €1.86 per m³ due to its need to catch up, followed by Austria (where the connection rate has been considerably increased) with €1.42 per m³, then Germany and France both with €1.17 per m³, the Netherlands with €1.09 per m³ and England/Wales with €0.97 per m³. According to estimates, just as in relation to drinking water (albeit with the exception of England/Wales), two thirds of the sum invested goes into the sewer network. In particular as far as wastewater disposal is concerned, there is a clear correlation between investment per m³ and wastewater prices per m³.

The sustainability of the investments was examined through an estimated split between renewal and extension investment (see Sec. 4.2.2). By including the expenditure for maintenance, a so-called **sustainability coefficient for network renewal** was calculated, which approximately reveals the proportion of the asset value is reinvested annually. In terms of the pipeline network, the level of reinvestment ranges from 2.0% in Germany, 1.8% in the Netherlands, 1.5% in England/Wales and 1.1% in France, 0.9% in Austria to 0.8% in Poland. In terms of the sewer network, the range is wider: it starts at 1.9% in Poland, through France and the Netherlands, followed by Germany at 0.7% and Austria at 0.5%, right down to 0.1% in England/Wales.

Taxes and levies

The prices comprise taxes, levies and charges in very differing proportions (see Sec. 5.2). In this context, **value added tax** on drinking water in Austria is 10%, in Germany and Poland 7%, in the Netherlands 6%, in France generally 5.5% and in England/Wales 0% (which entitles the suppliers to deduct input tax). For four of the six countries in the comparison, the level of value added tax on wastewater

is identical to that of drinking water. In Germany, there is a value added tax level of 19% for private-law companies but no value added tax obligation for public-law operations.

In addition, there are other water specific **levies and charges**. In the area of drinking water supply in Germany, for example, concession fees and water abstraction charges are collected. In England/Wales, Local Authority Rates and levies (including a water abstraction charge) are due to the Environment Agency. In France, water abstraction charges are levied. In the Netherlands, companies pay levies for groundwater use as well as concession fees; in addition, citizens pay a so-called tap water tax. In Austria, concession fees and in Poland water abstraction charges are collected. In terms of wastewater disposal, there are wastewater levies in Germany. In England/Wales, local authority rates and levies are due to the Environment Agency. In France, water protection measures as well as infrastructure investment are financed through a pollution charge. There are no charges in the Netherlands and Austria. In Poland there are fees for discharges.

Grants

In almost all countries, the companies within the water industry receive grants (see Sec. 5.3.2). Grants are afforded a special significance within this study, as they are referred to in the scope of the price comparison in order to calculate the prices necessary to achieve cost recovery.

Currently, in England/Wales only marginal grants are paid. Debt write-offs and transfer payments, which the water industry received in the course of privatisation in 1989 (so-called **green dowry** in the amount of £6.4bn) are treated, for the purposes of this study, as a grant spread over 30 years.

The average **grants** from 2001 to 2012 (price indexed and adjusted for purchasing power) to water supply and wastewater disposal amounted to €0.8bn in Germany, €2.2bn in England/Wales (from the green dowry), €2.1bn in France, €0.2bn in the Netherlands, €0.4bn in Austria and €1.4bn in Poland (mostly from EU funds). In terms of the water supplied, **specific grants** for the drinking water supply are therefore 30 cents per m³ in Poland, 18 cents per m³ in England/Wales, 11 cents per m³ in France and Austria, 3 cents per m³ in Germany and 0 cents per m³ in the Netherlands.

Grants for wastewater disposal are much higher than for drinking water supply. They were (in relation to the drinking water benchmark) 62 cents per m³ in Poland, 51 cents per m³ in Austria, 41 cents per m³ in France, 34 cents per m³ in England/Wales, 27 cents per m³ in the Netherlands and finally, 13 cents per m³ in Germany.

As such, one can conclude that in Germany and the Netherlands, hardly any grants are still paid (as well as in England/Wales, if the green dowry is disregarded) whilst the remaining countries are still a long way from prices which would achieve cost recovery. In France, the grants amounted to 19% of the investment in water supply and 41% of investment in wastewater disposal; in Austria these levels were 30% and 92% respectively and in Poland 66% and 40% respectively.

Summary of the structural framework conditions

The framework conditions described have an influence on the price level. In the following, each country is classified in respect of the four dimensions related to water supply and wastewater disposal. The lowest and the highest extremes in each dimension (in relation to the countries in the comparison and dependent on the direction of influence on prices) determine the maximum values. In terms of tendencies: the larger the red area, the stronger the structural arguments in favour of a higher price level are.

Germany tends to fulfil the requirements for a higher price level in water supply and wastewater disposal, primarily due to low water usage, low specific water losses, high rate of connection to treatment plants, high purification quality and the relatively high investment level.

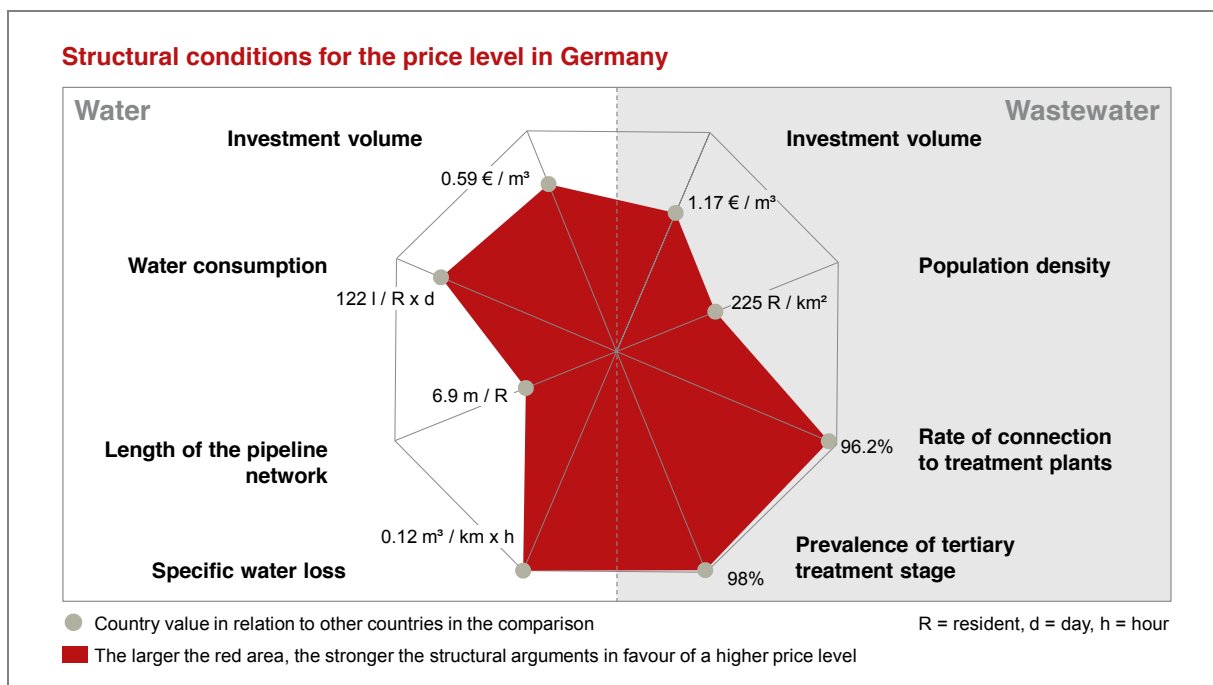


Fig. 1: Structural conditions for the price level in Germany

In **England/Wales**, investment in water supply and the rate of connection to treatment plants is high. All other parameters suggest lower prices.

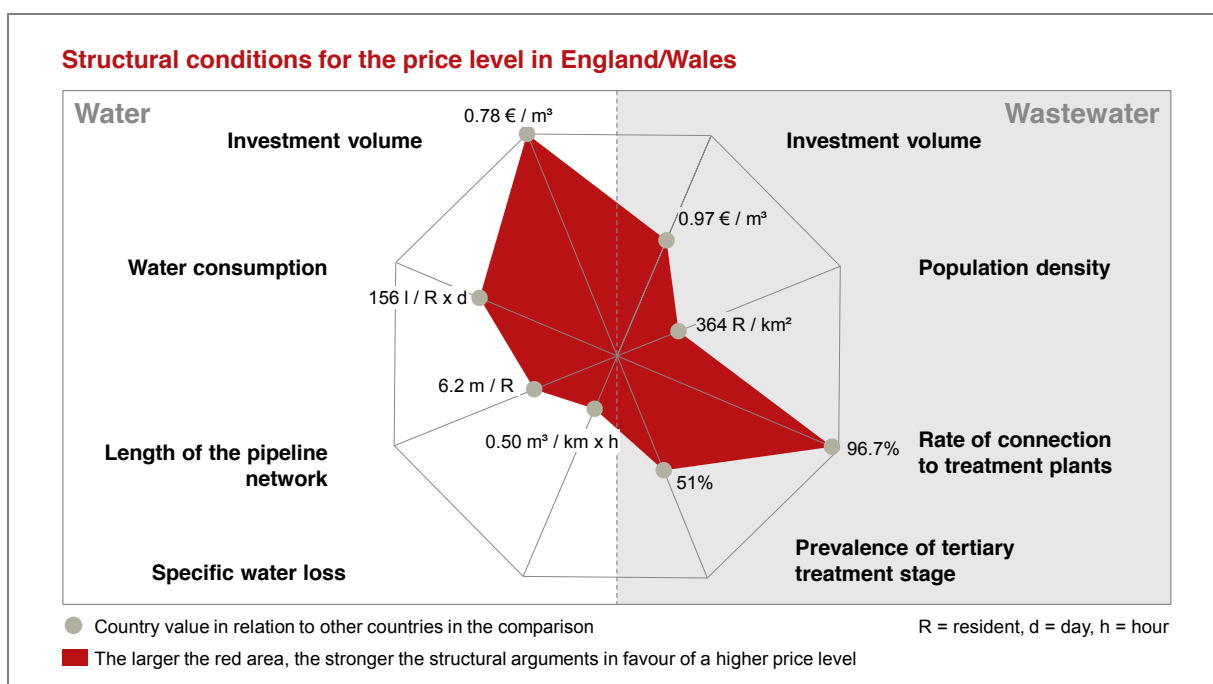


Fig. 2: Structural conditions for the price level in England/Wales

France, with its low population density and high length per resident of pipeline network, displays the conditions for higher prices. Factors against such an assumption, however, include the high level of daily water use, the very low rate of connection to treatment plants with three levels of treatment as well as the moderate level of investment.

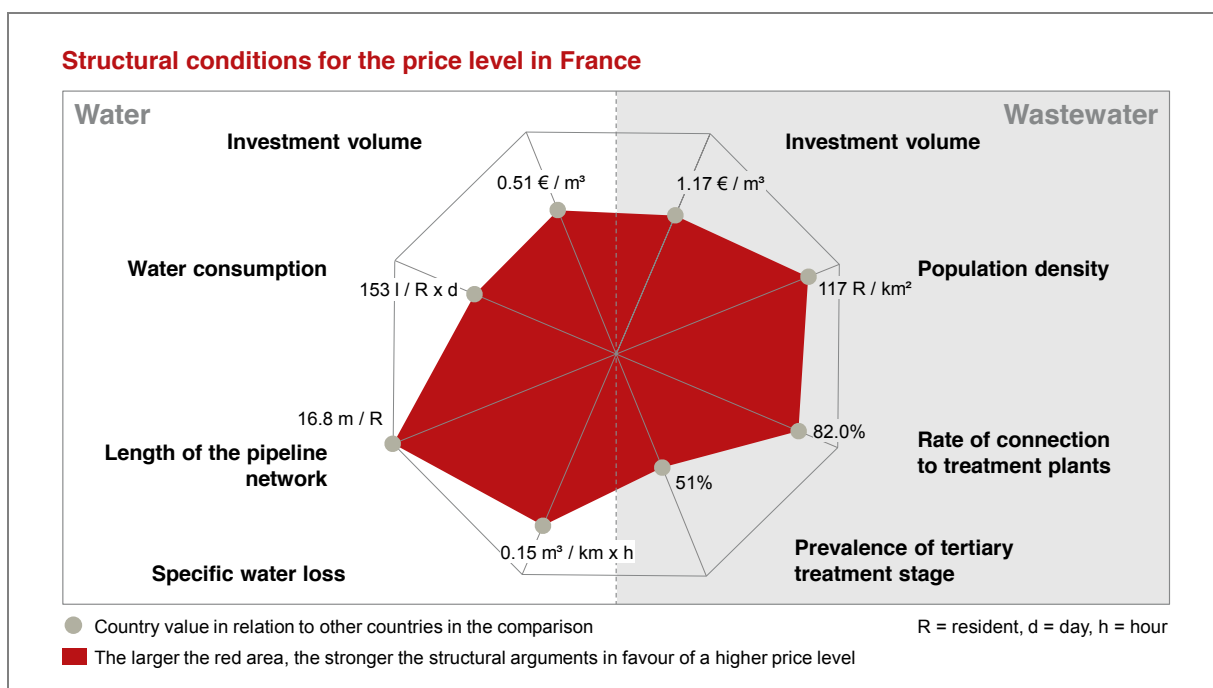


Fig. 3: Structural conditions for the price level in France

The level of service in the **Netherlands** can tend to lead to high prices. However, the relatively low levels of investment and the high population density have a price reducing effect.

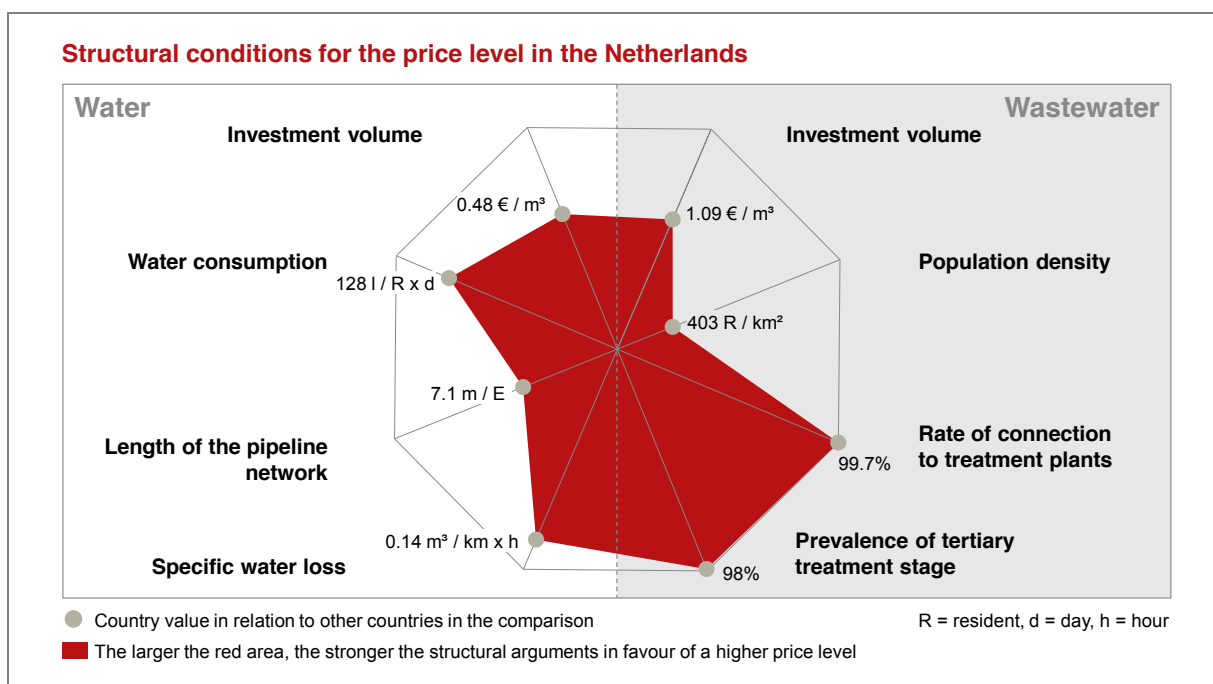


Fig. 4: Structural conditions for the price level in the Netherlands

Factors in favour of a high price level for wastewater in **Austria** are the high levels of investment, the low population density and the standard of service. In terms of water supply, the relative low levels of investment can be taken as an indication for lower prices.

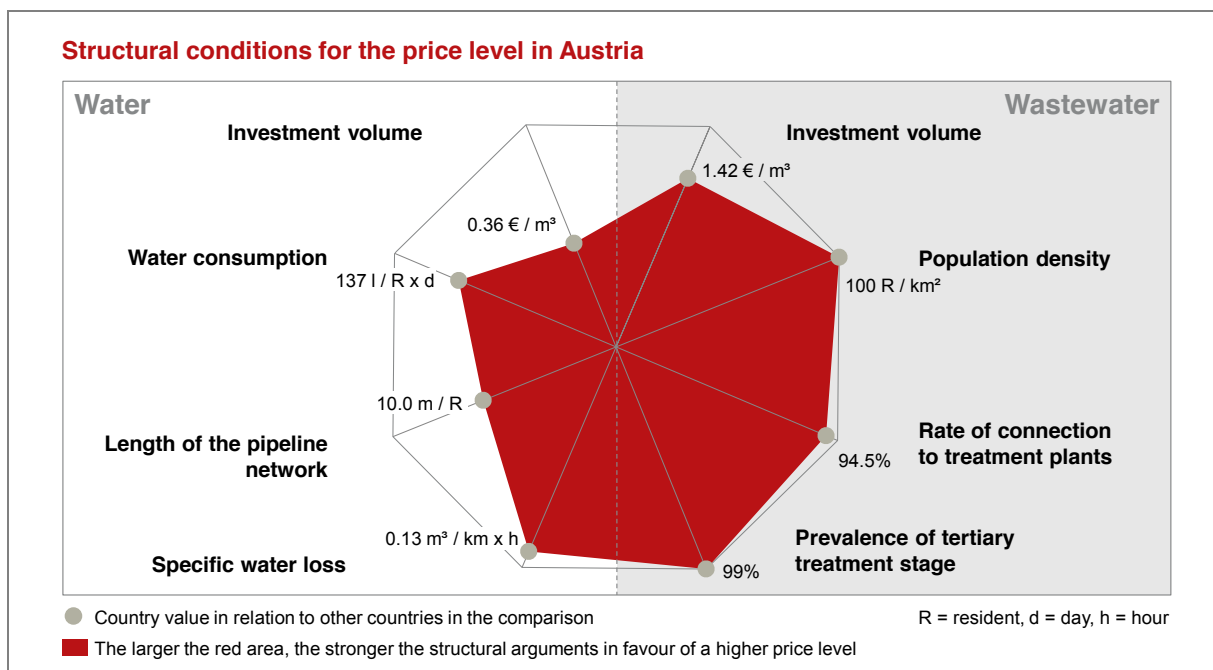


Fig. 5: Structural conditions for the price level in Austria

The high levels of investment in the water industry in **Poland**, the low population density as well as the low levels of water use indicate high prices, as do the clearly increasing rates of connection to treatment plants as well as the expansion of the tertiary treatment stage.

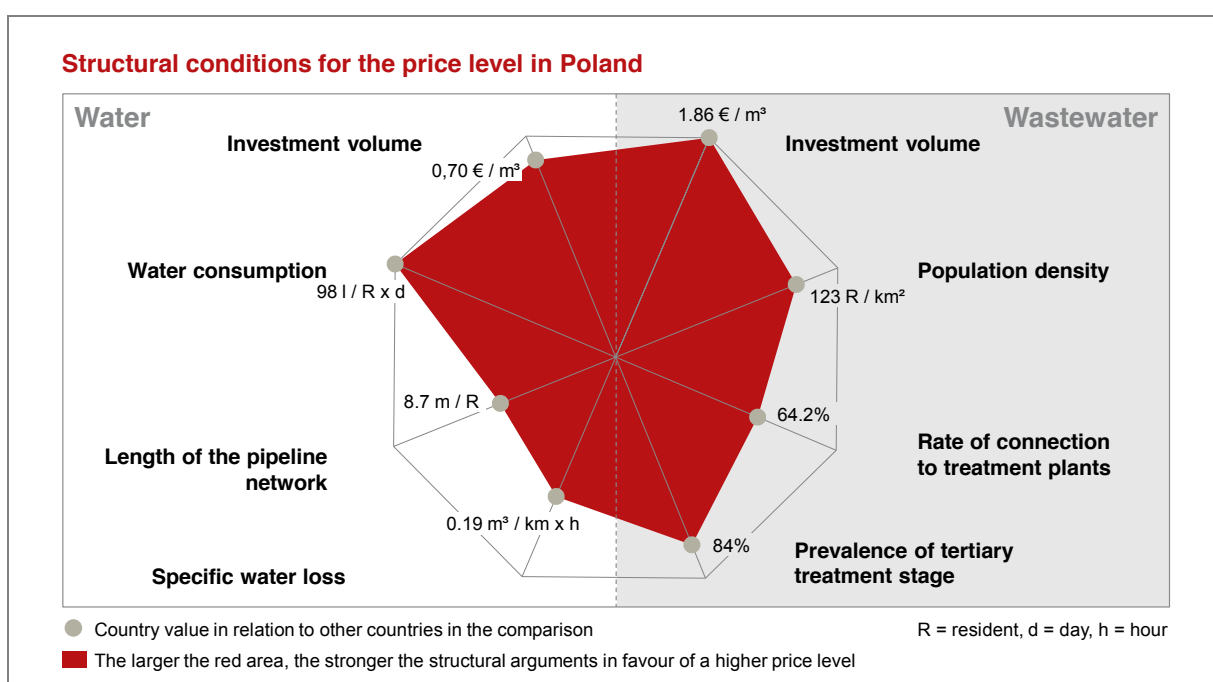


Fig. 6: Structural conditions for the price level in Poland

Comparison of water and wastewater prices

The prices² for water supply and wastewater disposal are influenced by many factors which affect the country specific cost level and therefore the price level.

The trend for prices per m³ of drinking water (adjusted for purchasing power and price indexed) has fallen in recent years whilst the prices for wastewater have risen.

The key determinants of water and wastewater prices remain, in addition to the degree of cost recovery and the service level, the structural framework conditions such as length of pipeline network per resident.

The comparison of water and wastewater prices is based on a **three level model** (see Sec. 6.1).

- Level I compares the country specific average prices. This takes into account fixed base prices and variable volume prices, however no one-off connection charges.
- In level II, a calculation is made as to how high prices would have to be for water and wastewater to achieve recovery of costs in the various countries if public grants are factored into the prices for water supply and wastewater disposal.³
- In level III, the prices of the countries in the study are compared under the assumption of uniform service standards. The prices in level III are hypothetical prices, calculated by including essential factors. In respect of the water supply, this calculation includes the opportunity costs (lost revenues) due to water losses as well as the equipping of households with water meters; in respect of wastewater disposal, the calculation includes modernisation of the sewer network, the connection rate to treatment plants as well as treatment at the tertiary stage.

For **water prices** (see Sec. 6.2) a comparison of prices shown as expenditures per capita per year across the countries in the comparison yields the following graph.

² As this study is an international comparison, no differentiation will be made between prices and charges; instead, only prices will be mentioned.

³ Average grants for 1995 – 2012 were included. In this study, the benefits conferred in the course of privatisation of the water and wastewater industries in England are treated as grants spread over 30 years. Further information can be found in Chapter 5.3.2.

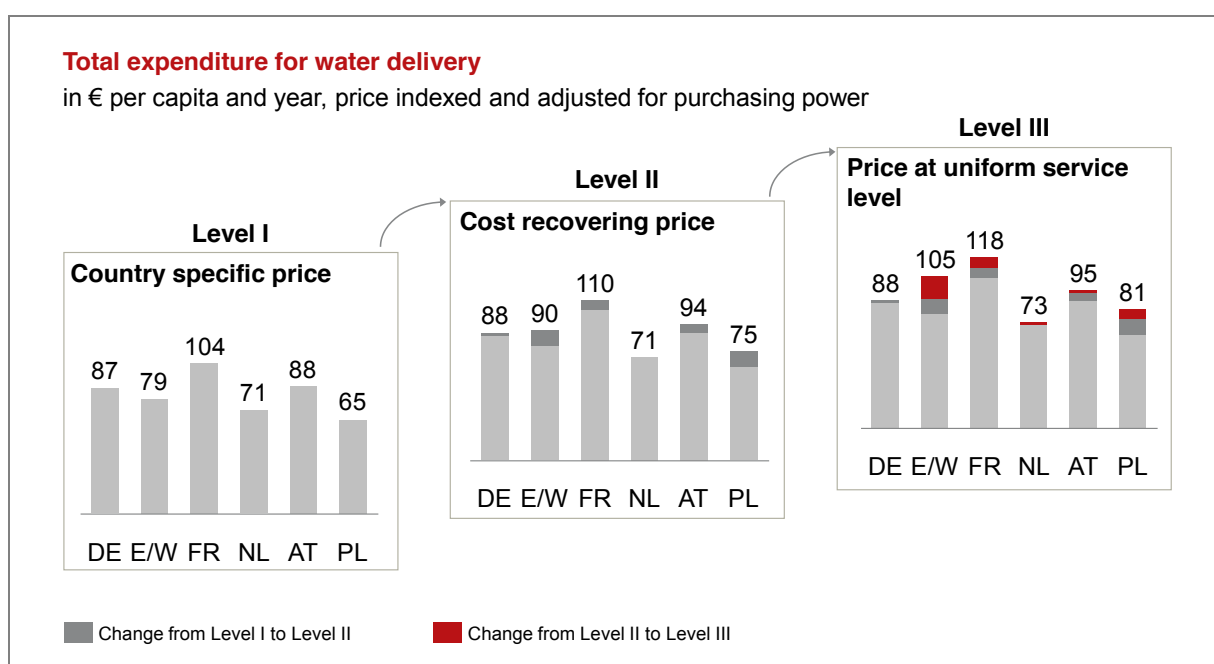


Fig. 7: Total expenditure for water delivery

A simple comparison of prices per m³ does not adequately reflect the actual burden for citizens. A comprehensive picture can only be obtained by measuring the expenditure per capita and year. The burden measured in expenditure per capita and year is the highest in France, at €104, and for Germany in the upper middle field.

The comparison in **level II** shows that prices respectively expenditures, taking into account average grants from 1995 to 2012, increased in many of the countries. In terms of expenditure per capita per year, France is also in first place in level II amongst the countries in the comparison, at €110, followed by Austria at €94. The lowest expenditure per capita per year can be found in the Netherlands, at €71.

In level III – assumption of a uniform standard of service – the price levels more closely equate to one another. For example in **England/Wales** and in **France** the expenditures per capita rise to over €105 and €118 per year respectively. **Poland** is a special case, which shows sharply increasing prices due to the ground it has to make up whilst the European grants also have to be factored in. Even if the per-capita burden is still at the lower end in level III, due to the low level of water usage, this equates to 5.4‰ of disposable income and as such a very considerable amount. In Germany, the Netherlands and Austria expenditures only rise marginally.

The following picture emerges in respect of **wastewater prices** (see Sec. 6.3):

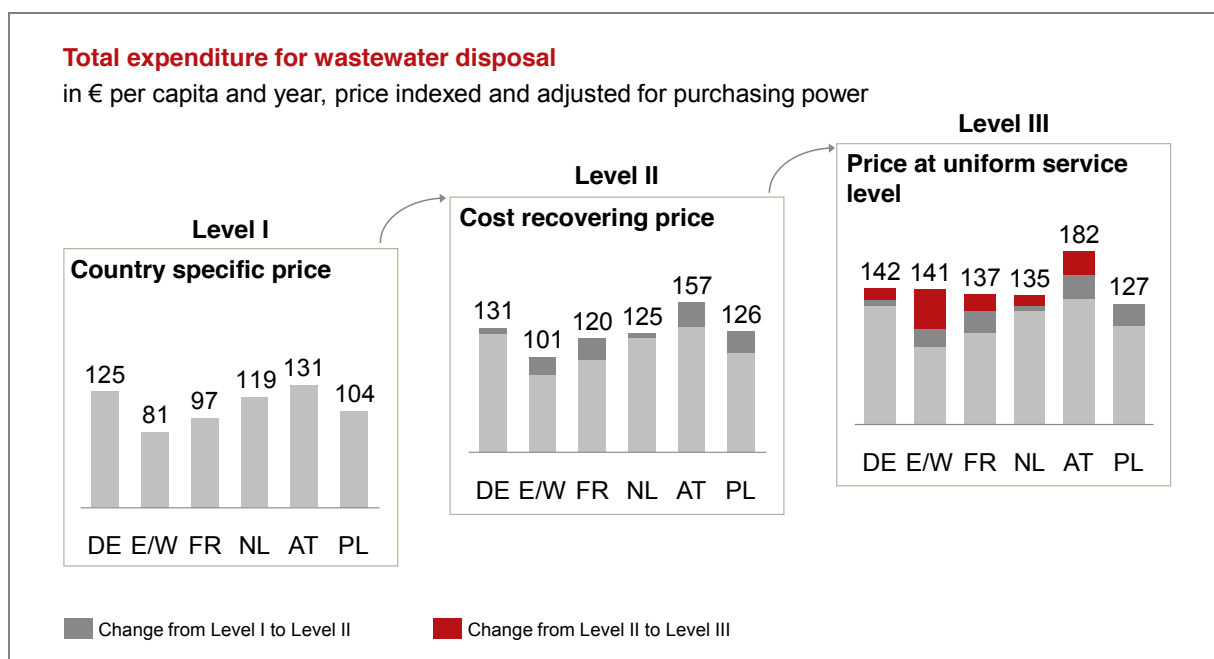


Fig. 8: Total expenditure for wastewater disposal

In the comparison of country specific average wastewater prices in **level I**, Germany is towards the top of the comparison group, at €2.80 per m³; only Poland is higher, with a wastewater price, adjusted for purchasing power, of €2.93 per m³. In terms of expenditure per capita per year, Germany is also in second place, at €125, exceeded only by Austria at €131.

In **level II**, wastewater prices change more markedly than water prices, when grants are included. The comparison, when taking volumes into account, shows that expenditure per capita per year is the highest in Austria, where it is €157. At €101, users in England/Wales pay the least. Germany, France, the Netherlands and Poland lie between those two values at €120 to €131 per capita.

At **level III** of the price comparison, the prices increase in part markedly. Applying the assumptions that all households connected to the sewer system are also connected to treatment plants, that all countries renew their networks with a rate of 1% per year and introduce uniform high standards at the tertiary treatment stage, the wastewater price increases. With the exception of Austria, for which expenditure per capita in the amount of €182 was calculated, the remaining countries' values were comparable, in a range between €127 and €142. Measured against the disposable income, however, this means for Germany and the Netherlands a proportion of 5‰ of the disposable income and in Poland of over 8‰.

Quality comparison

In the seventh section of the study, the water conservation, the quality of the drinking water supply, the extent and quality of wastewater disposal as well as customer service and consumer satisfaction are compared.

The **Implementation status of the Water Framework Directive** (see Sec. 7.1.) explains the ecological status which is comparatively not good, in particular in Germany, the Netherlands and Poland, for a large proportion of surface waters. The picture looks different in respect of the chemical status of the surface waters, which is, in particular in Germany and Austria, almost entirely good with 75% of waters

in the Netherlands at that level. The equivalent proportion in England/Wales and France was around a third in 2009 but the intention is to increase this by 2015 to almost 100% as it is in Poland (from 3% in 2009). The chemical status of the groundwater is, however, in Austria and Poland already almost completely good whilst for the remaining countries the level is just two thirds.

The **Quality of drinking water supply** (see Sec. 7.2) is presented on the basis of the implementation of the Drinking Water Directive. The microbiological quality of water in the major supply zones is met in all countries in the comparison at a level of 99% whilst the chemical quality in Germany, France and Poland is only met at a level of 95 – 99%. The problems in France are primarily due to pesticides and lead.

The requirements of the EU Urban Waste Water Directive on the **quality of wastewater collection and treatment** have been implemented in most of the countries under examination. In terms of wastewater collection, only Poland exhibits a greater need to catch up, with only 64% connected to the sewer system. As far as wastewater treatment is concerned, there are greater differences. Whilst Germany, the Netherlands and Austria subject almost the entire volume of their wastewater to a more stringent treatment, England/Wales, France and Poland are in need of improvement in this area. As such, England/Wales, France and Poland are not yet meeting the requirements of the Directive on more stringent treatment. However, one must take into account in this context that Poland (like Germany, the Netherlands and Austria), has high requirements as the country has identified its entire territory as sensitive, whilst England/Wales has done so only at a rate of 43% and France at 67%.

As such, one can summarise that the performance of the water industry in recent years in all countries has improved and has clearly reached similar levels in some areas. The investment associated with that process has generally led to price levels converging. Exceptions to this would be wastewater disposal in England/Wales and France, where the standards remain in part significantly lower than in other countries and the wastewater prices are accordingly lower.

In respect of the cost recovery required by the Water Framework Directive, different trends are evident. Whilst in Germany, the Netherlands and England/Wales, currently only marginal or low levels of grants are paid, such payments in France, Austria and (due to the considerable need to catch up) also in Poland are still very high.

2. Introduction to the Methodology

2.1 Starting point and objective

The water industry, as a general interest service, is the subject of numerous political discussions on a European level. The supply of water to around 474 million consumers across Europe and disposal of wastewater from a population equivalent of 671 million is associated with gross added value of €44bn and around 500,000 jobs.⁴

For 25 years now, standards on the scope of services and the quality of drinking water supply and wastewater disposal as well as on environmental protection have been set at a European level. The implementation of these standards has required and still requires enormous effort and investment. As a result, an equalisation of services and also prices has now been observed.

The water sector is the only economic sector in Europe for which EU Directives exist which not only lay down rules on the quality of services but also on pricing according to the recovery of costs. The differing service levels as well as the structural framework in the various countries, but also the differences in the implementation of the directives, affect the costs and prices of water supply and wastewater disposal. Comparisons of water and wastewater prices, which have been undertaken by various parties in recent years are often not sufficiently extensive or differentiated to take full account of the differing circumstances involved.⁵ That has various causes:

- Comparisons which only take into account the prices for water supply and wastewater disposal in the various countries bear an inherent risk that they may lead to emphasis being placed on the wrong areas and to controversy being created through rankings. In such comparisons, quality and level of service as well as financing structures are not considered.
- In addition to simple price comparisons, there are some studies which include the service level and the financing descriptively in the comparison of prices. These include the studies, Aqualibrium and MEIF, commissioned by the European Commission. However, the findings of those studies are also often unsatisfactory. Whilst the description of the individual countries can provide interesting insight into the conditions of the water and wastewater industry, due to the complexity of the factors to be considered and in some areas the unsatisfactory availability of data, a systematic comparison of countries is not undertaken. As such, questions as to the real burden on consumers, which include services and grants in water and wastewater prices, remain unanswered. This study provides answers to these questions.
- Until now, there has been one publication which attempted to look at the price level – only for wastewater – whilst taking into account grants, namely the "Comparison of Wastewater Charges in a European context", from 1998. The research commissioned by the German Federal Ministry for Economic Affairs and Technology, which was in part funded by the German Federal Environment Ministry, performs a systematic comparison and delivers interesting findings. However, the

⁴ Eurostat 2013; EC Synthesis Report on DWD 2014; UWWTD Implementation Facts and Figures 2013

⁵ Methodology, scope of the study and key findings of seven studies which were conducted up to 2006 are summarised in the state of research in the VEWA Study, 1st Edition, 2006, Appendix 1.

data originates from the period 1991 – 1996 and is therefore no longer up-to-date. Furthermore, even that study did not attempt to take account of the differing service levels when assessing the prices.

With the circumstances as they are, the German water industry is therefore subject, time and again, to the accusation that prices for water and wastewater are too high. At the same time, the discussion regarding the price is gaining in significance – both in an economic and political context.

Therefore, BDEW decided in 2005 to commission a study on services and prices⁶ of the water and wastewater industries in Europe. The aim of the study was to reduce the existing information deficit within the European price discussion and to contribute to a more informed argument in this area. The results, initially with four countries in the comparison, were presented in 2006. In 2009, BDEW commissioned an update of the study for Germany, England/Wales⁷ and France⁸ as well as an extension to include the Netherlands, Austria and Poland. Italy was no longer included for reasons of data quality. This study updates the comparison based on the reference year 2012. With these six countries in the comparison, over half of the residents of the EU-28 are covered.

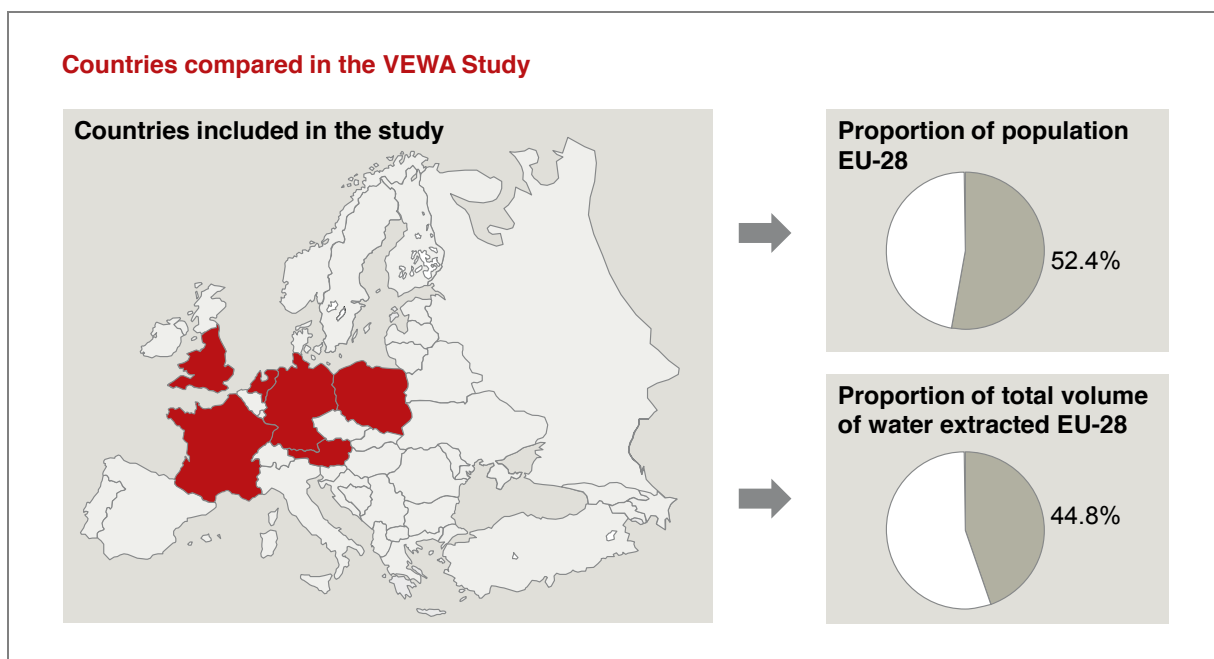


Fig. 9: Countries compared in the VEWA Study⁹

This study examines the public (central) water supply and wastewater disposal for households and small businesses. It covers, in addition to resource management, water abstraction and treatment as well as the distribution of water to households. Public wastewater disposal comprises the collection of

⁶ As this study is an international comparison, no differentiation will be made between prices and charges; instead, only prices will be mentioned.

⁷ England/Wales is examined in the study. Data for the United Kingdom is only indicated where the respective data for England/Wales was unavailable.

⁸ For France, only the 96 European departments are examined. The four overseas departments (Guadeloupe, French Guiana, Martinique und Réunion) are not included.

⁹ Use of the most up-to-date data available; Eurostat: water abstraction for public water supply

sewage and rainwater, wastewater treatment and sewage sludge disposal. The responsibilities of the public water industries are essentially identical in the six countries in the comparison here.

Neither water supplies to industry, industrial wastewater as well as decentralised plants are taken into account, nor is rainwater disposal from public spaces. Depending on how charges are calculated locally, however, households within the countries in the comparison could bear part of the costs for public drainage. However, average values cannot be determined.

2.2 Data collection and sources

The comparison of prices is based on representative data and statistics which have been published by ministries, institutions and associations within the countries in the comparison and the European Union (EU). The data covers large parts of the populations in the countries concerned, even though not all residents can be included in the statistics due to the large number of companies, in particular in Germany, France, the Netherlands (only wastewater), Austria and Poland. The data was extrapolated in each case from the respective sources to the whole country.

Data was collected on the basis of existing data in close consultation with the respective contact persons¹⁰ in the countries in the comparison, so that observation of the definitions and distinctions could be ensured as far as possible. Willingness to participate and interest in this study was very high in all relevant countries, which was reflected, in particular, in the willingness to cooperate regarding the collection of data.

On a European level, a substantial volume of data is now available, through Eurostat and WISE, which has been collected based on comparable definitions and for which time series exist. Nevertheless, allowances must be made in respect of the quality of data available on a national level: the situation regarding data available generally varies greatly across the relevant countries. In England/Wales, France, Austria and Poland, the data available is largely good, in Germany and the Netherlands it is very good. The availability of data in Poland has improved greatly compared to the last study.

Generally, the data collected in the countries in the study is only partially designed for international comparability, meaning much of the data available is not standardised. Therefore, for the purposes of this study, all country specific definitions were carefully checked and data limited as far as was possible and necessary in order to ensure comparability of the results. Where there are doubts as to the quality of the data or there are differing reference values within the data, these are indicated accordingly. The data base for the comparison of prices is the year 2012. In cases in which only price and cost data from differing reference years are available, the country specific data is adjusted to 2012 levels using the harmonised EU consumer price index.

Structural and service data, investment and prices (including sales tax) are extensively collected in all countries. Data on grants could be brought together from various sources. Macroeconomic data, as well as – in part – structural and service data, can be retrieved from Eurostat and WISE. The peculiarities of data collection in the individual countries are briefly explained below.

In **Germany**, the official statistics of the German Federal Statistical Office and the water statistics from BDEW and the economic data on wastewater disposal published by the German Association for Wa-

¹⁰ See list of contact persons at the end of this study.

ter, Wastewater and Waste (Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall, DWA) representatively cover a large proportion of the required data. However, due to the water sector's federal structure, data for the whole of Germany is not available either for water or wastewater regarding the value of the existing infrastructure or rate of renewal. In addition, levies and charges as well as grants are not recorded on a federal level. In the scope of this study, therefore, information on grants has been obtained from the respectively responsible Land (federal state) ministries. Although the data has been researched very carefully and responses were received from almost all ministries, the completeness of the data cannot be verified. Finally, the data regarding the quality of drinking water is taken from a report of the German Federal Ministry of Health and the German Federal Environment Agency.

After the census conducted in Germany in 2011, the figure for the population was adjusted downwards by around 1.5 million residents.¹¹ This effect leads to distortions in time series. For this reason, the population change reported by the German Federal Statistical Office was corrected by the proportional factor of the actual population values of 2011. As such, the time series used here, namely 1995 to 2010, shows lower population numbers than the official sources.

In **England/Wales** much data is available from OFWAT and the British Department for Environment, Food and Rural Affairs. As in England/Wales only around 42% of the connected population have a water meter, the prices for water and wastewater have been calculated on the basis of the average household bill. Data on water quality was collected from the Drinking Water Inspectorate (DWI). Generally, this study uses data from England and Wales, however where respective data is not available, data pertaining to the United Kingdom was used and indicated accordingly.

In **France**, the statistical institute within the Ministry of Environment collects extensive environmental statistics at irregular intervals for the water and wastewater industries, from 5,000 municipalities, which represents 75% of the population. A considerable volume of data originates from other databases and publications of the Ministry of Environment and its subordinate authorities. Data from the industry association for water companies was also used. Data on quality was reported to the EU from the French Ministry of Social Affairs and Health.

In the **Netherlands** almost all data in the water sector could be collected from the Association of Dutch Water Companies (VEWIN), which is able to provide extensive statistics on the basis of a national benchmarking exercise conducted every three years. Due to the decentralised organisation of the water sector, the data originates from several sources. Many of the values came from CBS Statline, the Dutch statistics office, including the data on grants. However, data on investment and grants is only recorded every two years, meaning that an interpolation was necessary to ascertain values for the intervening years. Dutch local authorities are represented by the Rioned Foundation which is commissioned by them to collect data – for some yet only partially – in particular on the municipal sewer networks, and extrapolate from that. The Unie van Waterschappen for treatment of wastewater and Rioned publish the Urban Drainage Statistics each year. Information on water quality comes from reports of the Dutch Ministry of Health, Welfare and Sport to the EU.

For **Austria** most of the technical data on the water supply was collected from the Austrian Association for Gas and Water (ÖVGW). Volume data also comes from Environment Agency Austria. Infor-

¹¹ See Press Release No. 283 of the German Federal Statistical Office of 27 August 2013

mation on total investment is not available. The subsidised investments and the paid out grants for water and wastewater on a federal level were obtained from Kommunalkredit Public Consulting. Grants on a national level were estimated. The value of the infrastructure as well as expenditure for maintenance are based on expert conversations and estimates. Information on drinking water quality comes from the drinking water report of the Austrian Federal Ministry of Health.

In **Poland** large volumes of structural and performance data is reported to a central body and published (Eurostat or "local database" of the Central Statistical Office of Poland, GUS). The annual environmental report "Ochrona srodowiska" was issued with an English translation in 2009 for the first time. Around 80% of Polish companies in the water and wastewater sector are organised within the "Chamber of Commerce 'Polish Waterworks'" IGWP (association), however it only releases very limited data and information to non-members. Therefore, it was only possible to obtain certain values through interviews with selected experts or company representatives. Nationwide information on quality comes from reports to the EU.

2.3 Adjustment for purchasing power and price indexing

In this study, all countries with their monetary data have generally been adjusted to the level of German purchasing power. The term purchasing power parity used in this study is concept from macroeconomic analysis. It exists if a basket of goods and services in two geographic areas can be purchased for the same amount of money. If this is not the case, the price level has to be adjusted using purchasing power parity ratios and factors.

For international price and income comparisons, ratios of purchasing power parities are often used in order to eliminate distortions through exchange rate fluctuations (in this case, for example, pound or zloty to euro). In order to make the price levels comparable, these purchasing price parity ratios have been used in this study, thus bringing all countries to the purchasing power level of Germany.

In addition, monetary data from earlier years than the reference year of 2012 was adjusted to the year 2012 using the Harmonised Index of Consumer Prices¹².

These adjustments have a profound effect, in particular in the case of Poland. In this way, values adjusted only for the exchange rate are more than doubled when adjusted for purchasing power. In recent years, the British value has moved closer to the relatively homogenous value in the Eurozone countries.

¹² The Harmonised Index of Consumer Prices (HICP) compares the rate of change of prices in the individual member states of the EU. The calculation of the HICP is necessary as the national consumer price indices differ due to individual historical circumstances, differing social frameworks as well as differing structures within the statistical systems.

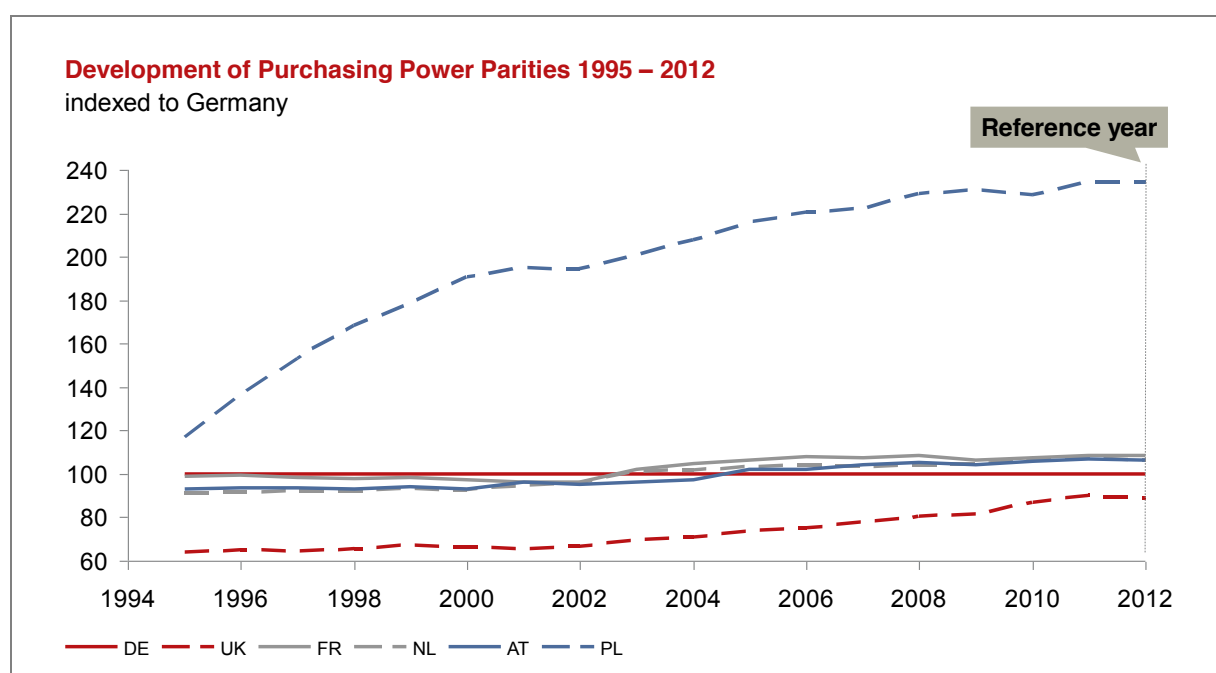


Fig. 10: Development of purchasing power parities 1995 – 2012¹³

Overall, it should be noted that within the presentation of the findings below, individual charts could display rounding differences, however these are only due to the usual rounding up or down of the decimal values; all calculations were based on the original values. For the purposes of customary practice, values in some of the representations are rounded to the nearest ten or hundred. Explicit reference to this rounding is not made in each individual case.

¹³ Eurostat Database; consumer price index only available for the United Kingdom, not separately for England and Wales.

3. Structure of the Water Industry

In order to be able to assess prices and performance of the water and wastewater industries in the countries in the comparison despite existing structural differences, the most important features of the respective structures are laid out below. A description of the regulatory policy framework and the demographic structure is followed by a comparison of the structures of the respective water and wastewater industries. Thereafter, the sources of water and volumes of water produced are presented.

3.1 Key macroeconomic data

3.1.1 Population structure

The total population of the 28 member states of the European Union is over 500 million. Of these, six countries with a combined population of 265 million residents are examined in this study. Germany has the highest population, at over 80 million residents, which accounts for around 16% of the population of the EU. The number of residents of England/Wales is over 50 million, in France over 60 million. Poland has almost 40 million residents and as such is almost half the size of Germany. There are far fewer people living in the Netherlands and Austria.

From a European perspective, Germany's 225 residents per square kilometre represent a relatively high **population density**, however this is far exceeded by England/Wales, with 364 and the Netherlands, with over 400 residents per square kilometre. In comparison, France, Poland and Austria are relatively sparsely populated. Number of residents and population density are presented in the chart below.

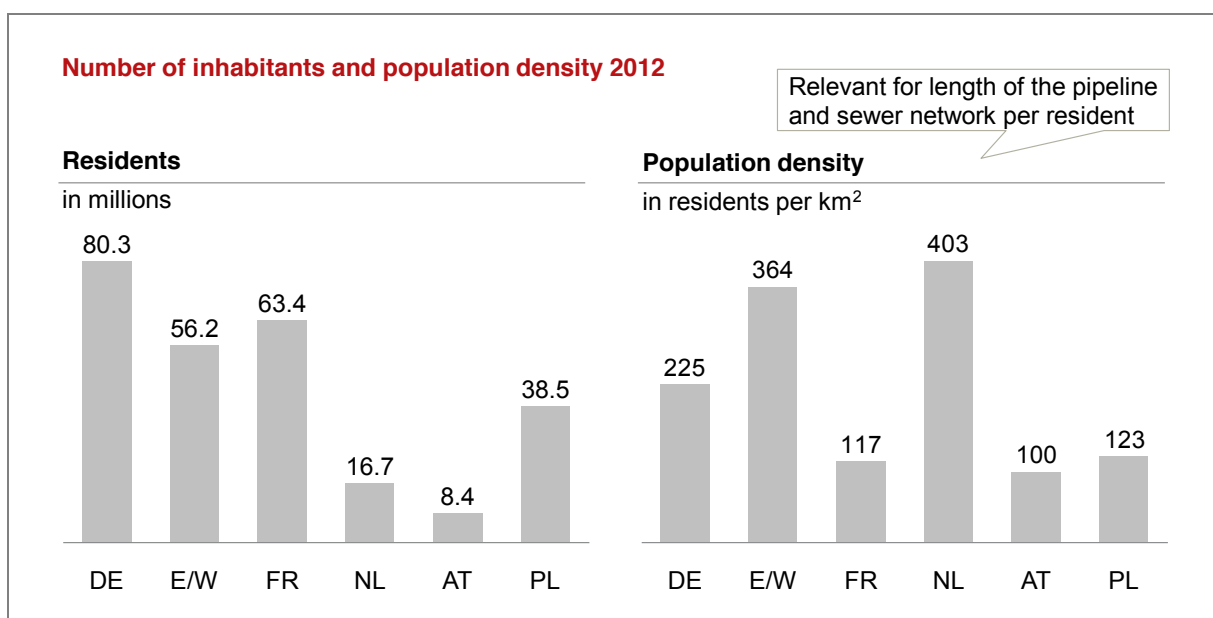


Fig. 11: Number of residents and population density 2012¹⁴

¹⁴ Eurostat: Studies on population change by NUTS-2 regions

For Germany, the population was adjusted downwards by around 1.5 million residents, by the census of 2011¹⁵. For this reason, all historical population data was adjusted accordingly.

As far as the **urban and rural population** is concerned, there are considerable differences between the countries in the comparison. Whilst in Germany, the United Kingdom¹⁶ and the Netherlands, considerably more than 80% of the population lives in towns or cities of over 5,000 residents, in France, Austria and Poland the equivalent figure is around just 60%.

Differences are also apparent in respect of the **household size**. In Germany, households are smallest at around 2.0 persons per household; in Poland, they are the largest, at 2.9 persons. England/Wales, France, the Netherlands and Austria, at between 2.2 and 2.6 persons, are between those figures. That means that in order to connect the same number of residents in Germany, more households need to be connected to the water supply and wastewater disposal systems than in the other countries.

The following graphic shows the urban and rural populations as well as the household sizes.

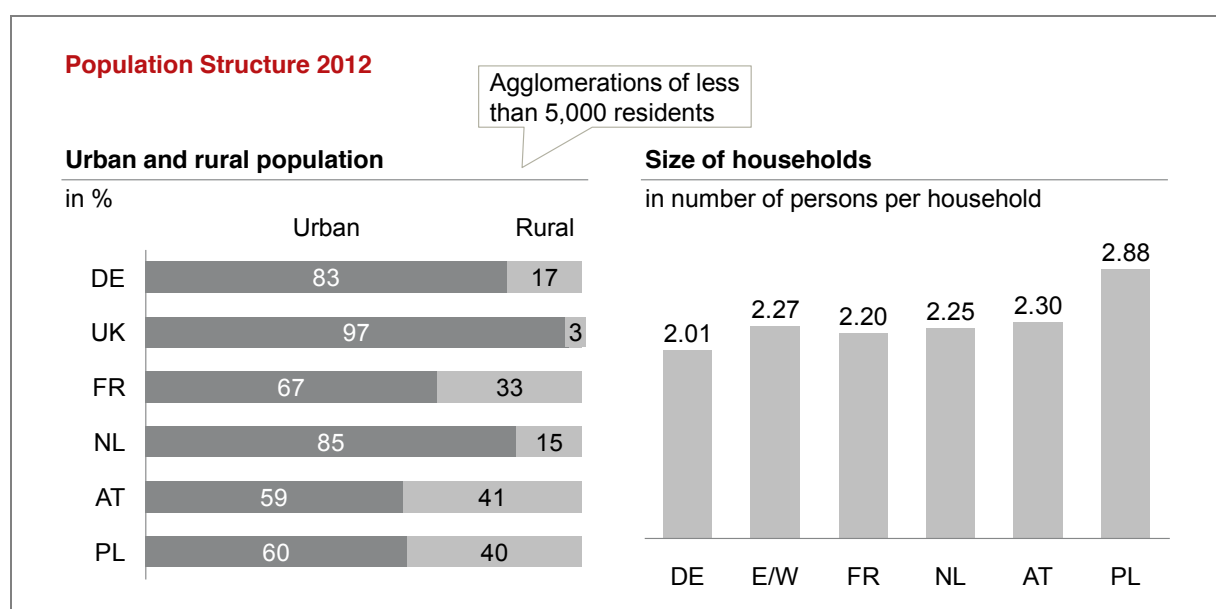


Fig. 12: Population structure 2012¹⁷

3.1.2 Income and price development

As expenditure for the public water supply and wastewater disposal is measured in relation to per-capita income, the development of income is also presented here.

The analysis of the **gross domestic product**¹⁸ per capita, adjusted for purchasing power, reveals a value for Germany and the Netherlands in 2012 of over €33,000. Only Austria is higher than this, with

¹⁵ See Sec. 2.5

¹⁶ There is no information available for the ratio of urban to rural population in England and Wales.

¹⁷ Eurostat: Study on Degree of Urbanisation (DEGURBA)

¹⁸ All data from Eurostat

a GDP per capita of over €34,000. The values for England/Wales and for France are, when adjusted for purchasing power, unlike the last edition of the study, slightly lower, at €28,000 and €30,000 respectively. Poland exhibits the highest rate of GDP growth, however it has a lower purchasing power adjusted GDP per capita, at €17,700 than the other countries.

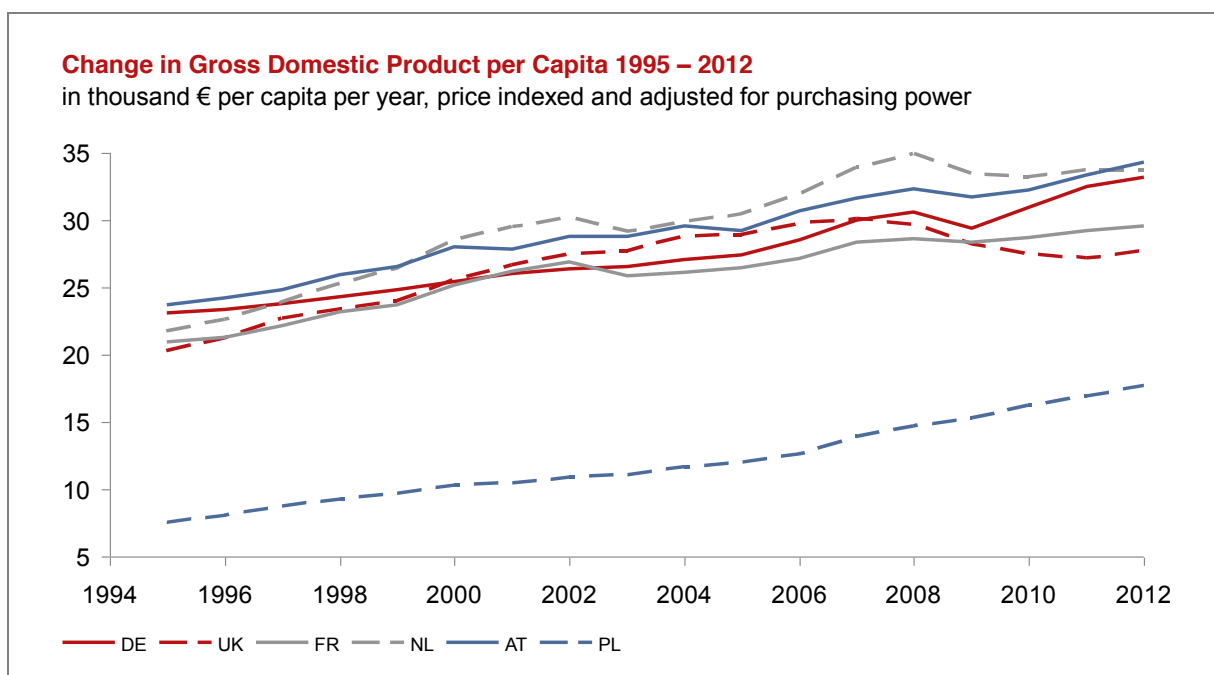


Fig. 13: Change in Gross Domestic Product per capita 1995 – 2012

Disposable income is understood to mean income plus state transfers to the social sector minus payments from the private sector to the state (taxes and social contributions). Germany, the Netherlands and Austria are close together at the top of the list of comparison countries.

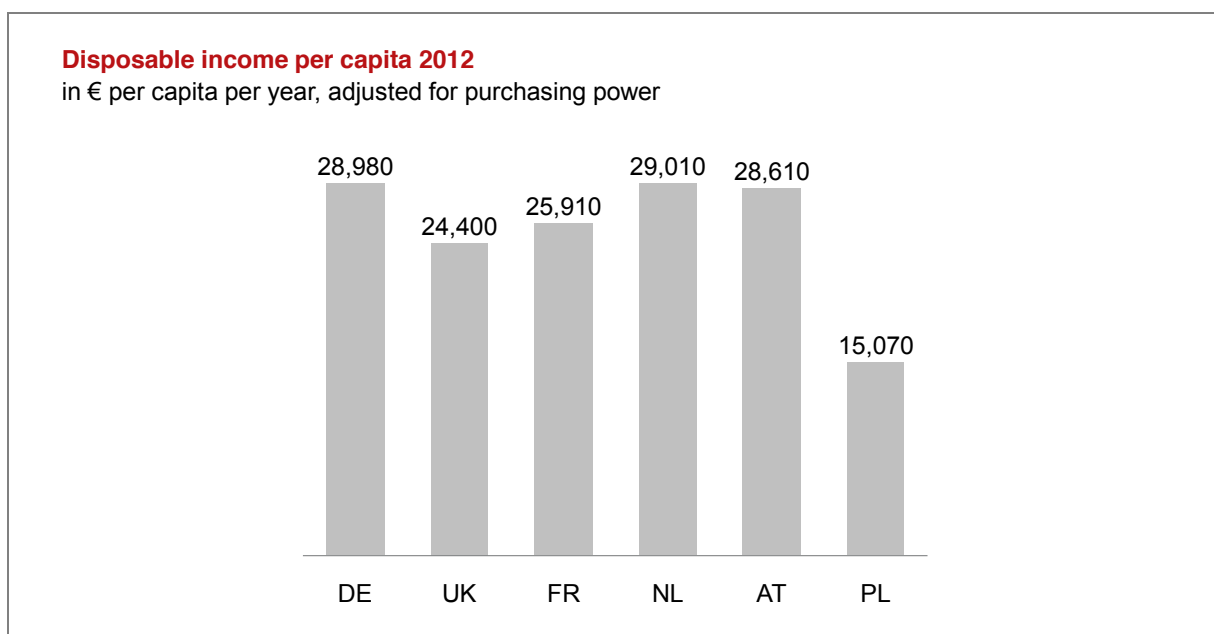


Fig. 14: Disposable income per capita 2012

In Poland, the disposable income amounts to slightly more than half of the value in the other countries in the comparison. In Section 6 expenditure per capita on water supply and wastewater disposal is presented in proportion to disposable income.

3.2 Regulatory policy framework of the countries

Legislation in the area of water supply and wastewater disposal is made on a European and state level, whereby the provision of own legislative competence of the Länder (federal states) is a special feature of the German and Austrian systems.

In Germany, France, the Netherlands, Austria and Poland, the **implementation** of water legislation (in particular investments, charges and grants) at a state level is decentralised (federal states and rural districts or regions, departments and provinces, respectively). In England/Wales in 2012, three central authorities were responsible for the implementation of water policy.¹⁹

Water supply and wastewater disposal in Germany, France, Austria and Poland is organised at a municipal level; in the Netherlands this only applies to wastewater disposal in the context of collection in the sewer network. The organisation of drinking water supply and wastewater treatment is undertaken in the Netherlands at the level of the provinces, the administrative level between the national government and the municipalities/local authorities. In England/Wales, the municipalities have not been involved since privatisation.

The **delivery** of water supply and wastewater disposal in Germany, Austria and Poland is in the hands of companies, works, management authorities or cooperatives and in France in the hands of the services publics or private companies (usually operational management companies). In England, the service delivery is performed by companies which are wholly privately owned. In Wales, a not-for-profit organisation, Welsh Water, has been given the task²⁰. In the Netherlands, drinking water supply is provided by (public) companies, whilst wastewater disposal is performed by municipal entities of the provinces or local authorities.

3.2.1 Number and size of companies

In **Germany**, the structure of the market is characterised by a few large and many small companies. Over 90% of the water supplied to households and industry is delivered by just one third of the companies. 1.6% of the water supply companies abstract around 45% of the entire water supplies in Germany²¹. However, small companies are still significant, especially in thinly populated, rural regions.

The main reason that Germany has a structure composed of many small parts is firstly the organisation on a municipal level and secondly the usually separated delivery of water supply and wastewater

¹⁹ The Office of Water Services (OFWAT) is responsible for the economic control and regulation of prices; the Drinking Water Inspectorate (DWI) monitors compliance with the prescribed quality standards for drinking water; responsibility for monitoring environmental standards was given to the National Rivers Authority (NRA), which was integrated into the Environmental Agency (EA) in 1995. Responsibility for monitoring environmental standards in Wales was handed to Natural Resources Wales in 2013.

²⁰ Homepage of Welsh Water, 2014: profits are used for investments or paid out to customers

²¹ See Profile of the German Water Sector 2014 (publication planned for first quarter of 2015)

disposal. The number of water supply and wastewater disposal companies has shrunk slightly in recent years. In 2010, there were 6,065 water suppliers and over 6,900 wastewater disposal entities.

In **England/Wales** water supply and wastewater disposal services were provided until 1973 by a large number of local, publicly owned companies and a few licensed private operators. In 1973, the water industry was reorganised by forming ten public water supply and treatment authorities. Each authority was responsible within a river basin for water supply and wastewater disposal as well as for water quality. 29 further private water supply companies, which supplied small areas with water, remained in their existing form.

In 1989, in the course of privatisation, the ten major water supply and wastewater disposal companies were mainly transformed into private stock corporations; today the majority of those companies is in the hands of institutional investors. These companies, which each abstract and treat over 100 million m³ of water annually, today dominate the structure of the water industry. Alongside these, there are nine smaller companies, which are solely responsible for water supply as well as five local water supply and/or wastewater disposal companies. One special feature of the English and Welsh market is the eight licensed distribution companies who provide their services to the major industrial customers. These major industrial customers are free to choose their service provider; in turn, the licensed service providers purchase resources and capacities from regional suppliers in order to meet their service obligations²².

In **France** also, the water supply and wastewater disposal is organised at the level of the municipalities. The 36,500 municipalities or associations of municipalities (after a reform to reduce the number of municipalities) have organised the responsibility into services publics. Due to the large number of municipalities, France exceeds the number of entities of the other countries in the comparison. Taking into account the services publics, which are responsible for water and wastewater overall, the total number of entities is around 35,000 (of which around 14,000 are only responsible for water supply and around 21,000 are only responsible for wastewater disposal)²³. These entities are not equivalent to companies, rather they are administrative entities on a municipal level, which are often not involved in the operational side. As such, the municipalities are usually only responsible for investments and billing, whilst the operational management is contracted to private companies.

In the **Netherlands** the structures of water and wastewater are different. Water supply is strongly centralised; a total of ten water suppliers²⁴ deliver over 1bn m³ of water per year on behalf of the provinces, three of them deliver over 100 million m³. The number of companies has been steadily falling for decades (111 suppliers in 1975, 37 in 1995, 10 since 2007), at least since the centralisation of water supply was stipulated by law in 1998.

The organisation of wastewater disposal is considerably more decentralised. Almost 430 local authorities are responsible for wastewater collection into their sewer networks; they perform this task themselves contract out to companies owned by them. 24 Waterschappen (regional water authorities) are responsible for wastewater treatment; these important regional water authorities act as a "fourth level of government" and operate own treatment plants. Ten of them treat over 100 million m³ of wastewater

²² Homepage OFWAT: 25 year licences are issued with 10 year notice periods (<http://www.ofwat.gov.uk/competition/wsl/>).

²³ Eaufrance: Observatoire des services publics d'eau et d'assainissement, 2010.

²⁴ VEWIN, Drinking Water Statistics 2012

annually. The Waterschappen have also experienced a process of concentration (from around 2,500 entities in 1950, 88 in 1994 to 26 in 2007). Adding Waterschappen and local authorities together, there are a total of 454 entities responsible. Just one company is simultaneously active in the areas of water supply and wastewater disposal.

In **Austria** there are around 5,300 companies in water supply and around 1,800 in wastewater disposal. The structure is characterised in that there are just a few large companies and many small companies. Around 200 water suppliers provide water to over 5.3 million residents. The 14 largest suppliers serve around 4 million residents which represents around 47% of the population or on average 287,000 residents each. 0.7 million residents obtain their water from domestic wells or own springs.²⁵ The number of wastewater disposal providers is similar to the number of wastewater treatment plants. The wastewater from around 47% of the population is treated in the 18 largest treatment plants (1% of the plants; size class >150,000 p.e.⁶⁰). A further almost 40% of residents are covered by the second largest treatment plants (11% of plants; size class 15,001 – 150,000 p.e.⁶⁰).²⁶

The structure in **Poland** is relatively fragmented as far as the companies involved are concerned. 729 entities supply the population with water. In the area of wastewater, 1,735 companies or entities within the municipal administration are involved in disposal²⁷.

It is difficult to compare the **sizes of the supply and disposal companies** in the six countries. Overall, however, in spite of the somewhat differing data base, a picture of the structure of water supply and wastewater disposal in the countries in the comparison emerges. In Germany, France, Austria and Poland there are numerous smaller companies whilst in England and Wales and in the Netherlands (in the area of water), just a few, large companies operate.

3.2.2 Forms of organisation

In **Germany** there is a series of different organisational forms within water supply and wastewater disposal. Local authorities and towns/cities provide the services of supply and disposal independently through a municipally owned and operated enterprise, a stand-alone municipally owned company or a government operated enterprise; they form associations, contract private companies for the management or operation of water supply or wastewater disposal or sell (partial) enterprises.

In this context, there are differences between water and wastewater companies. Overall, in the area of water supply, there is a trend towards private law entities and organisations. These comprise around 60% of the relevant companies (according to annual water supplies), 40% are public law organisations, of which the majority are water authorities and management authorities. The proportion of municipally owned and operated enterprises has fallen in recent years. Within the private law entities, joint public-private companies predominate, in the form of AG/GmbH entities (30%). These are usually companies in which private companies are shareholders²⁸.

²⁵ Homepage Austrian Association for Gas and Water (ÖVGW), (<http://www.ovgw.at/wasser/themen/?uid:int=294>).

²⁶ Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW), Kommunales Abwasser 2014.

²⁷ EUREAU, Statistics Overview on Water and Wastewater in Europe 2008.

²⁸ BDEW, 124. Wasserstatistik 2012.

In the area of wastewater disposal, the landscape in Germany is dominated by public companies. This is due to the classification of wastewater disposal as a mandatory public authority task of the municipalities. The most common form of organisation amongst wastewater discharge companies (weighted according to number of residents) is the municipally owned and operated enterprise (34%), followed by management authorities/water authorities (32%), public institutions (16%) and government operated enterprises (8%). Private law companies and stand-alone municipally owned companies account for 10%.²⁹

In **England** only private companies are responsible for water supply and wastewater disposal. In **Wales**, a not-for-profit, state organisation, Welsh Water, is responsible. Since privatisation, there have been numerous takeovers and mergers within the water and wastewater industries, which primarily affected the smaller companies. As OFWAT prohibits mergers between British water suppliers and wastewater disposal companies on competition grounds, today many English companies belong to foreign holding and investment companies.

In **France** both water supply and wastewater disposal are tasks of public authority. The infrastructure is owned by the municipalities who include their investment expenditure largely in the water and wastewater prices. In total, there are three different forms of organisation within water supply and wastewater disposal. Water supply and wastewater disposal are run by the municipalities as government operated enterprises (régie). In the case of “délégation” or “affermage” (the most important model, in particular in water supply), they hand the operational management over to private companies. Investments are financed by the municipalities, maintenance and renewal by the operational management companies. In the case of “concession”, the municipalities transfer both operational management and responsibility for new investment (planning and financing) for a certain period of time to private entities. In these cases, the new plants remain in the possession of the municipalities.

Due to the low settlement density and the high number of smallest size municipalities, in 2004 around 36% of municipalities did not have central wastewater disposal. That corresponds to around 8.0% of households and 5.4% of the freshwater volume.³⁰ More up-to-date data is currently unavailable.

Private companies play a key role in French water supply and wastewater disposal. Overall, around half of the municipalities have decided to award contracts to private companies for the operational management of water supply and wastewater disposal. The private market is dominated by three large corporations, Veolia, Lyonnaise des Eaux and Saur, which combine the small water and wastewater service providers; they supply around 65% of connected residents with water and dispose of around 51% of connected residents' wastewater. In the concession model (i.e. new investment by private entities) around 14% of new investments are made.³¹

In the **Netherlands** the water industry is primarily the responsibility of public authorities. In this context, a distinction must be made between water supply and wastewater disposal. In the water sector, all ten supply companies, with only one exception, are limited companies in full ownership of the local authorities and/or provinces.³² They generally provide their services for several provinces. The Dutch

²⁹ DWA Wirtschaftsdaten Abwasserbeseitigung 2014.

³⁰ Ministry of Environment, Enquête Eau 2004, 2007.

³¹ BIPE/FP2E: Les services collectifs d'eau et d'assainissement en France. – 5th Ed., 2012.

³² VEWIN (publisher), Drinking Water Statistics 2012

government decided at the end of the 1990s to leave drinking water supply in the hands of the public authorities in order to preserve the well-functioning water management system (including flood protection which is extremely important for the Netherlands) as well as the quality and security of supply. A systematic benchmarking, obligatory for all companies, was seen as the preferred way to promote efficiency in the water industry.

In the case of wastewater, the organisation of collection and treatment are separated. The local authorities are responsible for the sewer network and the collection of sewage and/or rainwater; 99% of the entities tasked or contracted by the local authorities are in public ownership.³³ The wastewater treatment plants are built and operated by the provinces themselves or by the Waterschappen (regional water authorities) tasked by the provinces. The Waterschappen are governmental institutions which, in the general hierarchy, are beneath the provinces on the level of the local authorities. In addition to wastewater treatment and quality control of surface waters, they also have various responsibilities in connection with securing waterways and the land (much of which is below sea level) against flooding, such as monitoring sea levels, constructing and maintaining dykes, sewers and pumping stations but also monitoring the groundwater table and, since January 2009, the operational management of groundwater.³⁴

In **Austria**, there are varying forms of organisation involved in water supply, however all companies are directly or indirectly in public hands. A distinction is made between companies as a part of the local authority administration, water associations (amalgamations of several local authorities), companies set up as joint stock corporations in which the state owns a majority of the shares and water co-operatives.³⁵

Wastewater treatment plants and the sewage system are mainly separated from an organisational perspective. A variety of forms of organisation exist for wastewater treatment plants. Most of (the large) plants are organised as private law entities which were (status as at 2002) exclusively or primarily under the ownership of local authorities or associations. As far as local sewers are concerned, the local authority is almost always owner as well as operator, even if the local authority is part of an association. Outfall sewers (beyond settlement areas) are in the ownership and operation of the respective association.³⁶

In **Poland** powerful municipal authorities have been responsible for water supply and wastewater disposal since the state reforms of 1990, when central planning of the economy was abolished; the system now comprises 2,478 gminas (municipalities = towns/cities and rural districts). The water companies previously owned by the Polish central government were re-municipalised. Even though Polish law permitted privatisation of companies, this option was rarely used. In the water sector, companies supplying 90% of the total water volume are publicly owned, either in private law form with all shares owned by the municipality or as entities operated within the respective authorities (comparable to the German "Eigenbetrieb"). Companies who provide 7% of the total volume can be attributed to the private sector; 3% are mixed forms of organisation. In terms of the number of companies, however, it

³³ Eureau (publisher), Statistics Overview on Water and Wastewater in Europe 2008.

³⁴ Unie van Waterschappen (publisher), Water governance, the Dutch waterschap model, 2008; Unie van Waterschappen, Climate Change and Dutch Water Management, December 2008.

³⁵ ÖVGW (publisher), Die Österreichische Trinkwasserwirtschaft, 2013.

³⁶ Schönbeck et al., Internationaler Vergleich der Siedlungswasserwirtschaft, 2003.

should be noted that in only 0.6% of cases do foreign companies have a stake with own capital.³⁷ The number of public private partnerships (PPP) is very limited. Investors are Aquanet (in Poznan), Gelsenwasser (in Glogow), Veolia (in Bielsko-Biala and Tarnowskie Gory), RWE Aqua (in Dabrowa Gornicza) and SAUR (in Gdańsk).³⁸

The situation regarding wastewater is similar. Generally, all companies and municipal entities are responsible for both collection and treatment. 90% of companies are public, 5% private and 5% mixed.³⁹

3.3 Water and wastewater volumes

3.3.1 Water sources and water abstraction

Statistical information is categorised according to the source of the water: groundwater (water originating underground not including riverbank filtrate and not including enriched groundwater), spring water, riverbank filtrate and surface water (lake water, artificially impounded water, river water and enriched groundwater).

Germany is a country rich in freshwater resources. The most important source for the public drinking water supply are groundwater resources. 61% of the total demand for water supply is covered in Germany by groundwater, 31% by surface water and 8% by spring water.⁴⁰

In **England/Wales** the water discharged fed into the water supply network comes predominantly, in contrast to Germany, from surface waters. Only around a third of the total demand for water supply is covered by groundwater.⁴¹

In **France** groundwater (67%) and surface water (33%) are used for the drinking water supply.⁴² The source of the water depends greatly on the respective region. Whilst in the south and west of France, as well as in the region around Paris, water shortages prevail and groundwater abstraction is problematic, there are large natural groundwater resources in the mountain regions and alluvial plains.

In the **Netherlands**, 65% of water abstracted comes from groundwater, almost 34% from surface water and 1% from dune water – namely groundwater found in dunes and other coastal areas. Some regions experience problems with volumes of groundwater as this is extensively used by agriculture as well as industry. The treatment of surface water is more complex (and therefore more expensive) as it can be affected, amongst other things, by saltwater from the sea or by fluctuating pollution loads at the mouths of the major rivers.⁴³

³⁷ Eureau, Statistics Overview on Water and Wastewater in Europe 2008.

³⁸ Public Service International Research Unit, Water companies in Europe 2010.

³⁹ GUS (publisher), Municipal infrastructure in 2011 tables.

⁴⁰ BDEW, 124. Wasserstatistik, 2012.

⁴¹ IWA: International Statistics for Water Services 2014.

⁴² Ministry of Environment, Base de données Eider.

⁴³ VEWIN (publisher), Drinking water fact sheet 2013.

59% of the drinking water supply in **Austria** comes from spring water and 41% from groundwater. Water from both sources can often be supplied without treatment or after a precautionary disinfection. Surface water plays a negligible role.⁴⁴

In **Poland** 70% of the total water requirement is met through groundwater abstraction, the rest from surface water.⁴⁵

Some European countries often experience periods of water shortage during periods of drought. The lack of water available in those periods also has an effect on the electricity supply. For example, the heatwave in France in July 2005 caused blackouts which led to interruptions in the supply of electricity to Germany. Due to differences in climate, sufficient reserves and sustainable management, the water supply in Germany is secured even in prolonged heatwaves and dry spells.

Despite its considerably larger population, the volume of water abstracted in Germany is somewhat smaller than in England/Wales and in France. This leads to significant differences in respect of the abstraction per connected resident. Whilst the annual volume in Germany is 63 m³ per capita, in England/Wales it is much higher, namely 105 m³.

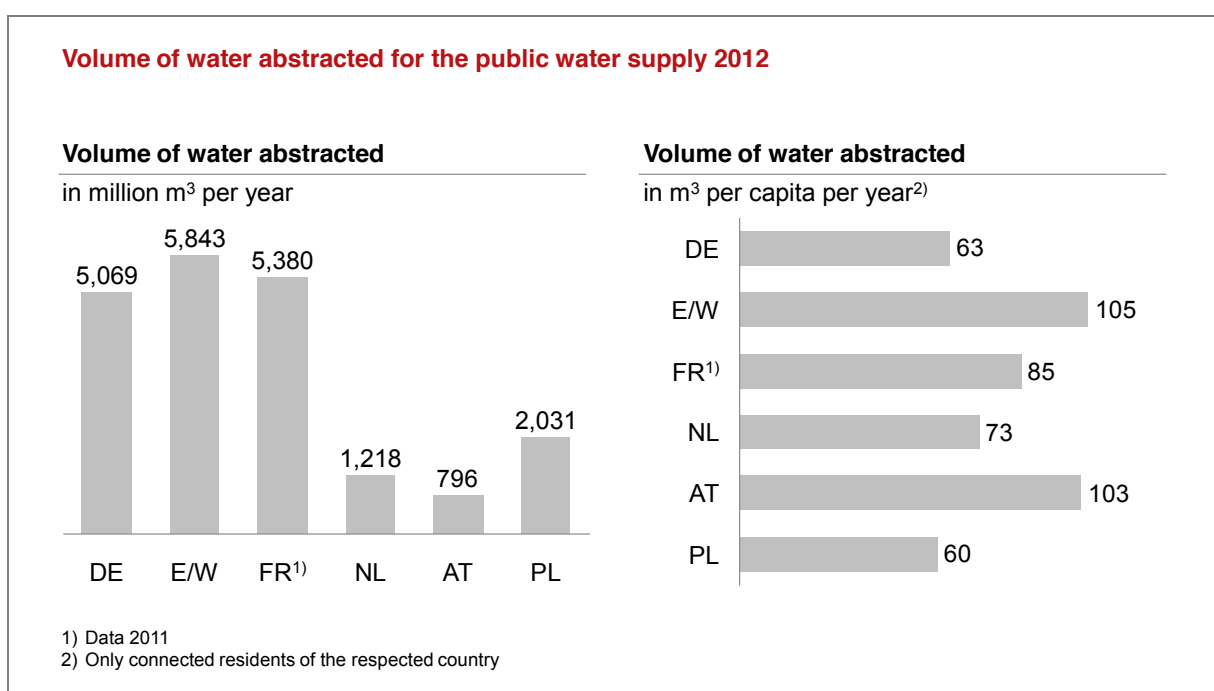


Fig. 15: Volume of water abstracted for the public water supply 2012⁴⁶

The water supply (= total volume of water abstracted and used by third parties) is disregarded here in order to avoid double counting through water usage at the various stages in the value chain.

44 ÖVGW

45 Ochrona srodowiska 2013, p. 152.

46 Germany: BDEW, 124. Wasserstatistik 2012; England/Wales: Defra, Total estimated abstractions and licensed abstractions from all sources by purpose, England and Wales (2000-2012) tables; France: Ministry of Environment, Base de données Eider; Netherlands: CBS, Environmental accounts; water use and abstraction tables; Austria: conversation with experts, ÖVGW; Poland: Ochrona srodowiska 2013. Note: Due to in part differing data sources regarding water and wastewater, there may be inconsistencies in the data.

3.3.2 Water supplied and sewage

Water supplied to end consumers (= private households including skilled crafts, trades and small businesses, commercial companies and other consumers including agriculture) is understood to mean the total volume of water supplied through the distribution network (not including water losses). The constant or slightly falling trend (except for in the Netherlands) in water supplied from 1995 to 2012 is shown in the following graph.

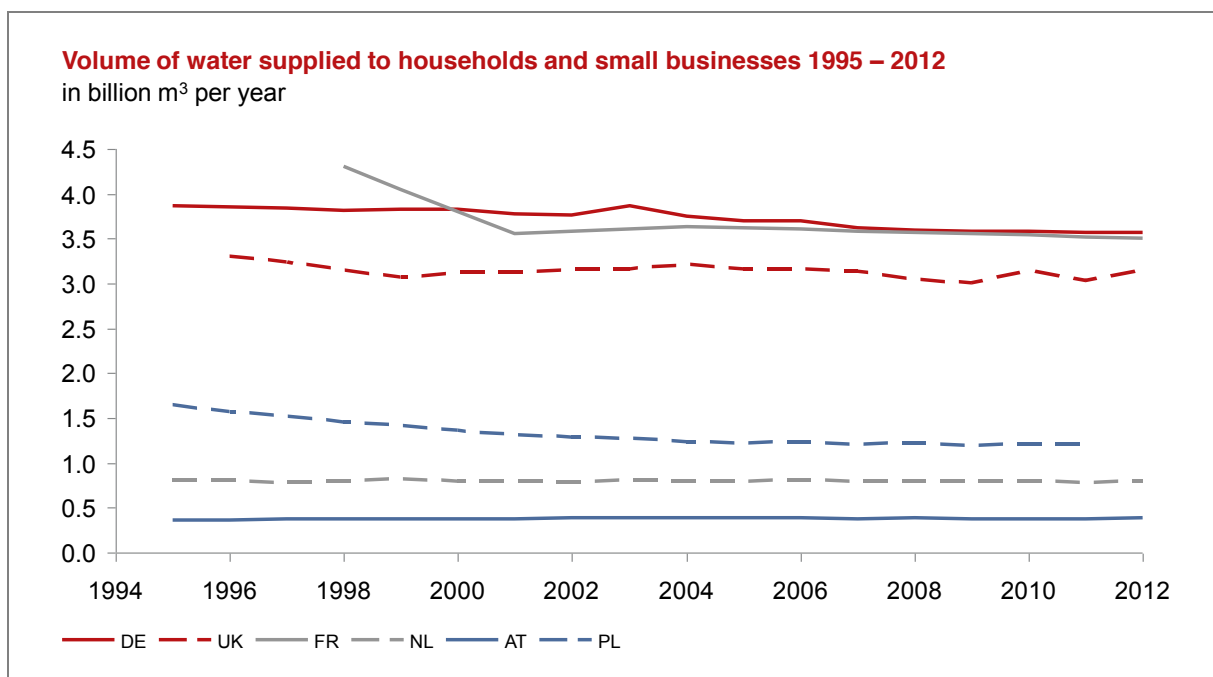


Fig. 16: Volume of water supplied to households and small businesses 1995 – 2012⁴⁷

The term sewage is used to refer to household and industrial wastewater which has been altered through use and discharged into a drainage system (sewer network).

⁴⁷ Germany: BDEW, 124. Wasserstatistik 2012; German Federal Statistical Office, 2006, Fachserie 19 Reihe 2.1.2, Table 1.2 and extrapolation; England/Wales: IWA, International Statistics for Water Services; OFWAT, June returns 2010/2011; France: IWA, International Statistics for Water Services, FP2E; Les services publics d'eau et d'assainissement en France; Netherlands: VEWIN (publisher), Drinking Water Fact Sheet 2013; CBS Statline and own calculations; Austria: conversations with experts, ÖVGW; Poland: GUS (publisher) regional database

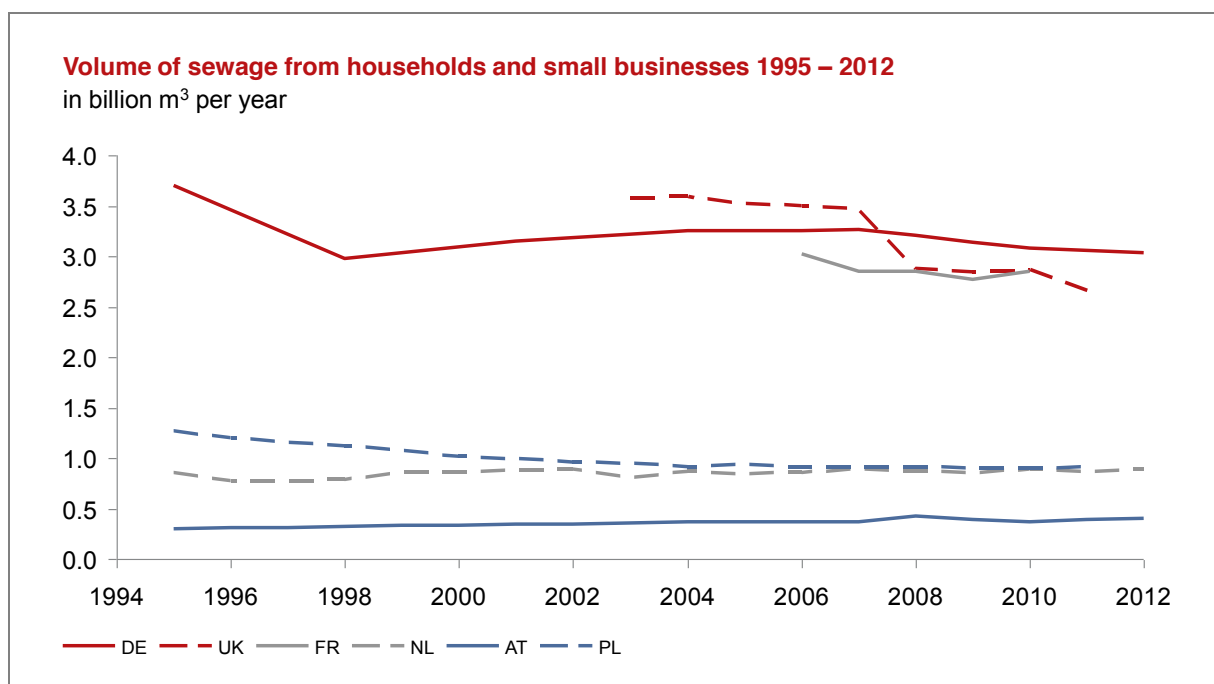


Fig. 17: Volume of sewage from households and small businesses 1995 – 2012⁴⁸

As no data is available for Austria regarding sewage volumes, these were estimated in consultation with the Environment Agency Austria (Umweltbundesamt) on the basis of water supplied to households and the rate of connection to wastewater disposal systems and are therefore of only limited reliability.

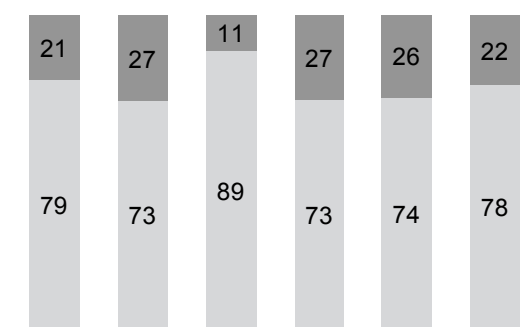
In all of the countries in the comparison, households and industry have their water supplied by or wastewater disposed of by companies. The percentage share of the total volumes differ, however, with considerably stronger variations in the case of sewage.

⁴⁸ Germany: BDEW, 124. Wasserstatistik 2012; German Federal Statistical Office, 2006, Fachserie 19 Reihe 2.1.2, Table 1.2 and extrapolation; England/Wales: IWA, International Statistics for Water Services; OFWAT, June returns 2010/2011; France: IWA, International Statistics for Water Services, FP2E; Les services publics d'eau et d'assainissement en France; Netherlands: VEWIN (publisher), Drinking Water Fact Sheet 2013; CBS Statline and own calculations; Austria: conversations with experts, ÖVGW; Poland: GUS (publisher) regional database

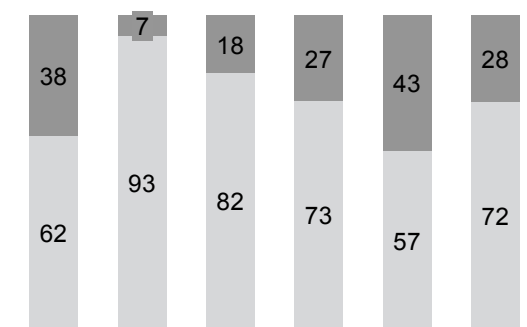
Proportions of volume of water supplied and volume of sewage removed 2012

in % of the total volume of water supplied or sewage removed

Volume of water supplied



Volume of sewage



Households and small businesses Industry

1) Data 2011

2) Data 2004

Households and small businesses Industry and others

Fig. 18: Proportions of volume of water supplied and volume of sewage 2012⁴⁹

In this study, from this point onward only the prices for water supply and wastewater disposal for households will be considered. All of the figures on which the study is based on the water industry will therefore be scaled down according to the proportion of supply going to households⁵⁰.

Water consumption per capita describes the average volume of water supplied per head per day. The average volumes per head has been calculated from the water supplied and sewage collected from households and small businesses, which has then been divided by the connected population. The countries in this study exhibit considerable differences in this respect.

In Germany, France, Austria and Poland the published averages correspond approximately to the data calculated here; in England/Wales and in the Netherlands, however, the consumption according to the published official statistics is 150 litres and 120 litres per head per day respectively⁵¹ and thus differs from the calculated values of 156 and 128 litres respectively. For reasons of consistency of data, the calculated water consumption is used, as in the previous VEWa studies.

⁴⁹ Germany: BDEW, 124. Wasserstatistik 2012; German Federal Statistical Office, 2006, Fachserie 19 Reihe 2.1.2, Table 1.2 and extrapolation; England/Wales: IWA, International Statistics for Water Services; OFWAT, June returns 2010/2011; France: IWA, International Statistics for Water Services, FP2E; Les services publics d'eau et d'assainissement en France; Netherlands: VEWIN (publisher), Drinking Water Fact Sheet 2013; CBS Statline and own calculations; Austria: conversations with experts, ÖVGW; Poland: GUS (publisher) regional database

⁵⁰ The scale-down is undertaken based on the volume of water supplied and the volume of sewage.

⁵¹ Waterwise, Water – The Facts, 2014; VEWIN (publisher), Drinking Water Statistics 2012

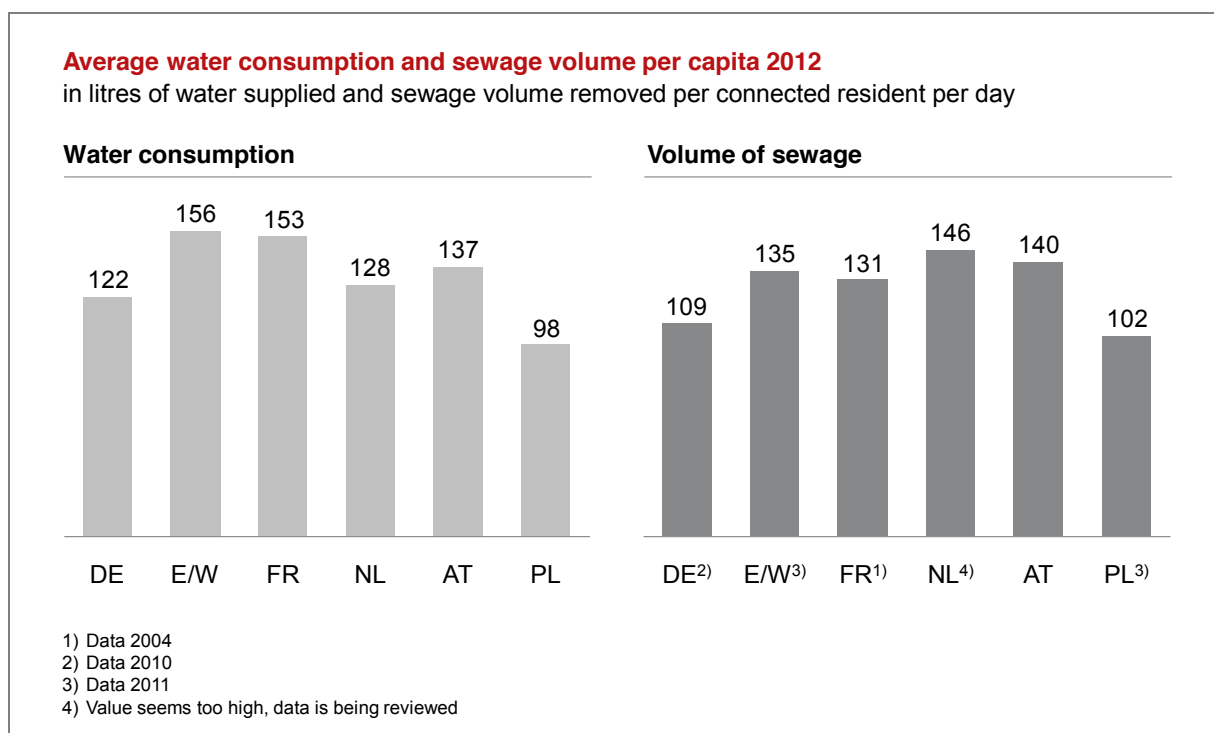


Fig. 19: Average water consumption and sewage volume per capita 2012⁵²

Average water consumption per head and average sewage discharge is, in addition to the total costs of water supply and wastewater disposal, the crucial factor in determining the price per m³. On the one side, lower consumption reduces the expenditure for the individual consumer. On the other side, lower consumption increases the price per m³ as the fixed costs of the infrastructure are then spread over a lower volume of water and wastewater.

3.3.3 Wastewater treatment

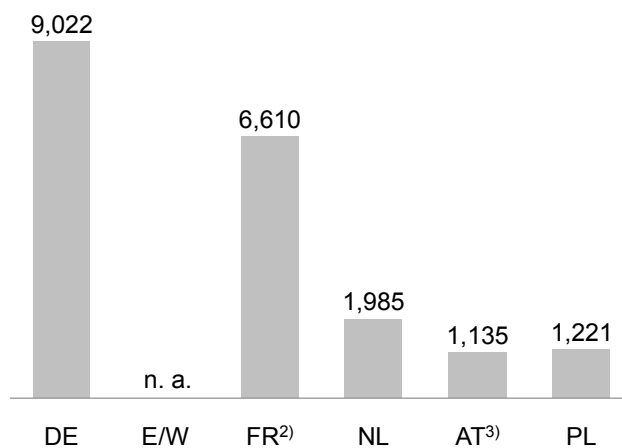
Wastewater treatment is generally understood to mean all techniques employed with the objective of harmless disposal, purification, reuse and recovery of reusable materials from the wastewater. The purification is performed in treatment plants and similar facilities. The objective of wastewater treatment is to dispose of the substances in wastewater and restore the natural water quality.

The volume of wastewater treated comprises for all countries, sewage, rainwater and other infiltration.

⁵² Own calculation; Note: due to in part differing data sources regarding water and wastewater, there may be slight inconsistencies in the data.

Volume of wastewater treated 2012¹⁾

in million m³ per year



1) For households and small businesses, industry, others

2) Data 2004

3) Data 2010

Fig. 20: Volume of wastewater treated 2012⁵³

⁵³ Germany: German Federal Statistical Office, 2010, records of wastewater treatment and own extrapolation; England/Wales: no data available; France: Ministry of Environment, Base de données Eider; Netherlands: CBS Statline (publisher) database; Austria: Resources and discharge of wastewater by volume; Eurostat; Poland: GUS (publisher) local database.

4. Infrastructure and Investment

4.1 Infrastructure

The infrastructure for the water supply comprises basically water works, storage facilities, pumping stations, the pipeline network and other plants and works necessary for water abstraction and distribution, not including domestic distribution systems. In respect of wastewater disposal, the infrastructure examined consists of the sewer network (combined or sanitary sewers), treatment plants and other plants or works necessary for the collection and treatment of wastewater.

In this section, the infrastructure of the six relevant countries will be compared on the basis of connection rate, treatment stages, network length, water losses and the value of the infrastructure. These framework conditions are crucial factors in determining the costs of water supply and wastewater disposal. In this respect, for example, thinly populated countries with a strongly rural settlement structure will require a longer pipeline and sewer network, in comparison to countries with a high population density and a high proportion of urban population, in order to achieve the same rate of connection to the public water supply. At the same time, the costs per resident increase if the required investment sums are divided amongst a low number of people.

As far as the age of the existing infrastructure and the average expected useful life of the plants are concerned, no conclusions can be drawn from a comparison of the countries. Firstly, a reliable base of data is lacking. Secondly, the comparison is only of limited informative value as the plants can be replaced through renewal investments or kept in good condition through maintenance measures. As such, no sweeping statements can be made as to the condition of the plants as substance preserving maintenance is certainly no disadvantage to the quality of the network.

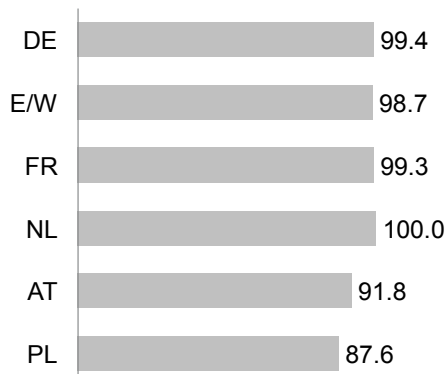
4.1.1 Connection rate and treatment stages

The rate of connection to the public water supply and wastewater disposal system is understood to mean the proportion of the population which is connected to the network and/or to treatment plants. As far as disposal is concerned, a distinction must be made between connection to the sewer network and connection to treatment plants.

In the six countries in the comparison, the rate of connection to the **water supply** differs. Connection to the pipeline network is at almost 100% in Germany, England/Wales, France and the Netherlands; in Austria the rate is far lower, for reasons of topography and the rural settlement structure across large parts of the country. Poland (almost 87%) has a need to catch up in this area. In recent years, considerable efforts have been made to restore and extend the ailing infrastructure; in 1995, for example, the connection rate in Poland was just 76.5%. Furthermore, connecting households in remote locations in the relatively thinly populated country is very costly; in these parts supply from an own domestic well is still the dominant situation.

Rate of connection to public water supply and wastewater disposal 2012
in % of total population

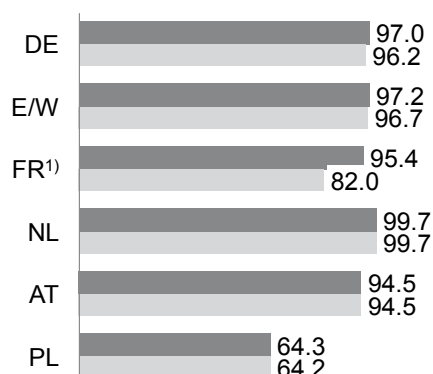
Water supply



■ Connection to pipeline network

1) Data 2010

Wastewater disposal



■ Connection to sewer network

■ Connection to treatment plants

Fig. 21: Rate of connection to public water supply and wastewater disposal 2012⁵⁴

In Germany, France and Austria, water consumption of all connected residents is recorded with water meters, even if in Germany, for example in apartment blocks, several households are billed through one water meter and a pro-rata apportionment of costs. In the Netherlands and Poland, 96% and 94% respectively of connected residents have a water meter; in England and Wales the figure is just 42%. OFWAT's objective is to increase this proportion. In this respect, for example, the plan is to have all households in sensitive areas equipped with water meters by 2030.

The European Urban Wastewater Directive (Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment) stipulates that all agglomerations with a population equivalent of over 2,000 be provided with collection systems by 2005 and that the wastewater collected be subject to a so-called secondary treatment. Since then, the content of the Directive has been largely implemented: in Germany, for example, of the agglomerations with over 2,000 residents, almost all are connected to the collection system.⁵⁵ There is a special feature in Poland, due to its later accession to the EU, whereby the dates of implementation of the requirements from the Directive are still in the future (see Sec. 7).

The rate of connection to **wastewater disposal** is lower than that in respect of the water supply in all of the countries in the comparison, except for Austria. The rate of connection to the sewer network is

⁵⁴ Germany: BDEW estimate based on previous year's values of the German Federal Statistical Office as well as Eurostat; England/Wales: Drinking Water in England and Wales 2012, Eurostat and OFWAT expert statement; France: Ministry of Environment SISPEA database and FP2E; Les services publics d'eau et d'assainissement en France, 2012; Netherlands: Eurostat database, Rioned, Rioleren in beeld; Austria: ÖVGW (publisher), Die österreichische Trinkwasserwirtschaft (The Austrian Drinking Water Industry), 2013, BMLFUW, Daten und Zahlen (Data and Figures), 2009; Poland: GUS (publisher), Municipal infrastructure in 2012 tables, expert conversation at KZGW.

⁵⁵ European Commission (publisher), 7th Commission Summary on the Implementation of the Urban Waste Water Treatment Directive, Brussels, 2013 in conjunction with European Commission, Technical assessment of information on the implementation of Council Directive 91/271/EEC, Brussels, 2012.

over 90% in five of the six countries examined. In Poland, the connection rate has increased continuously for the last ten years and is now at a good 64%.

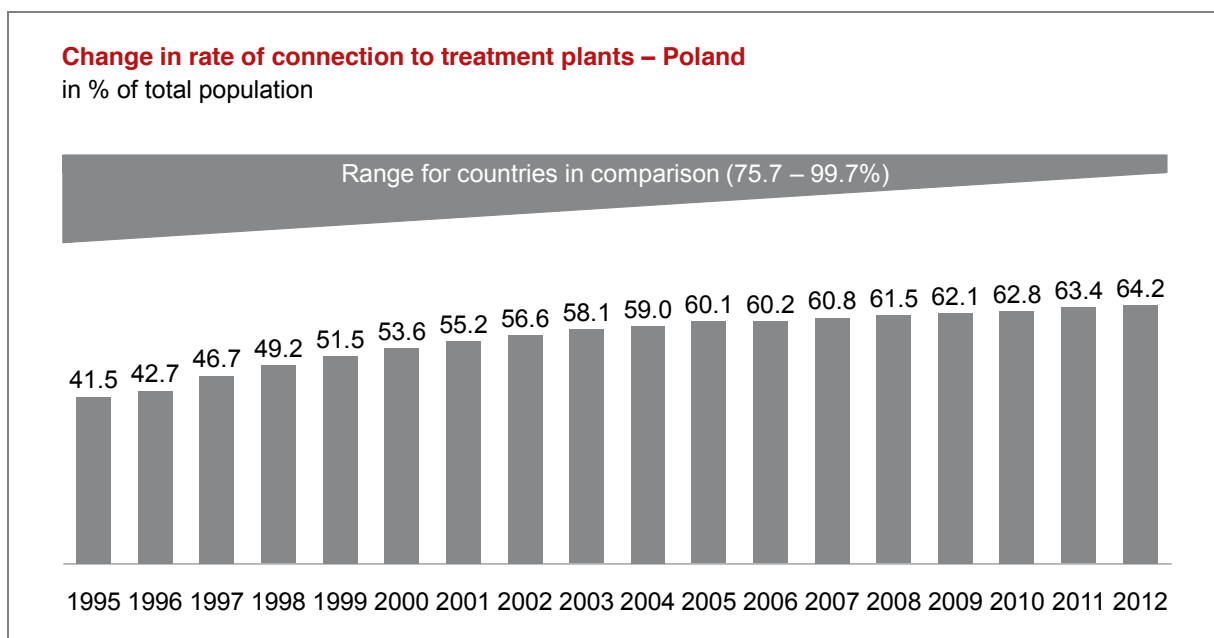


Fig. 22: Change in rate of connection to treatment plants – Poland⁵⁶

Despite major improvements in Poland in recent years there was and still is a great need to catch up, even more so than in the area of water. For many years, vast quantities of wastewater were discharged untreated into the countryside⁵⁷, in particular outside major towns and cities. Today, the connection rate in cities is at 87% and in rural regions at 28%.⁵⁸

There are similarly large differences in respect of the connection to wastewater treatment plants. In Germany (96%), England/Wales (96%) and the Netherlands (100%), most residents are connected to treatment plants. In France, the connection rate is just 82%, due to the lower population density, in Austria the rate is 94% and in Poland 64%. The reason for the comparatively low connection rate in this respect is the many, small dispersed settlements and remote households which exist across large parts of the three countries. In many rural regions, in which the population is not connected to the system of public wastewater disposal, the wastewater is collected in cesspits or other decentralised facilities and disposed of.

For Poland, the total investment requirement for complete implementation of the Urban Wastewater Directive is estimated to be over €11bn.⁵⁹

⁵⁶ GUS, Municipal Wastewater Treatment plants tables, Eurostat, population changes, own calculations

⁵⁷ In 1988, 36% of the wastewater was not treated at all and 35% only with mechanical methods (Robin de la Motte, PSIRU, Business School, University of Greenwich: D10i WaterTime National Context Report – Poland, January 2005).

⁵⁸ GUS (publisher), Municipal infrastructure in 2011 tables.

⁵⁹ European Commission (website): ec.europa.eu/environment/water/water-urbanwaste/implementation/factsfigures_en.htm

Considerable differences are also evident in respect of the stages of **wastewater treatment**. By way of introduction, the three standard stages are as follows:

Mechanical treatment (also known as primary treatment) is understood by the Directive to mean physical/chemical processes used to reduce the suspended solids by at least 50%.

Secondary treatment is defined as the treatment of wastewater through a biological step with a secondary settlement tank or another process (e.g. membrane system) in which the requirements established in Table 1 of Annex I (i.e. specific values for reduction in concentration or discharge concentration requirements for the parameters BOD5 and COD as well as suspended solids) are complied with. For this process, no targets for nutrient removal are stipulated.

More stringent treatment or tertiary treatment is understood to mean treatment of wastewater to complement the secondary treatment, with the aim of eliminating so-called plant nutrients (nitrogen and phosphorus compounds). The tertiary treatment stage has an essential positive influence on the quality of inland waters. By reducing phosphates and nitrates, one can prevent those substances entering surface waters. The required result of the tertiary treatment is measured according to specific reductions in concentrations or discharge concentration requirements for the parameters total P and total N overall (i.e. the sum of Kjeldahl-nitrogen, nitrate-nitrogen and nitrite-nitrogen). The efficiency of the wastewater treatment plants can be estimated from the expansion stages of the wastewater treatment plants and assessed on the basis of the actual retention or elimination of pollution loads.

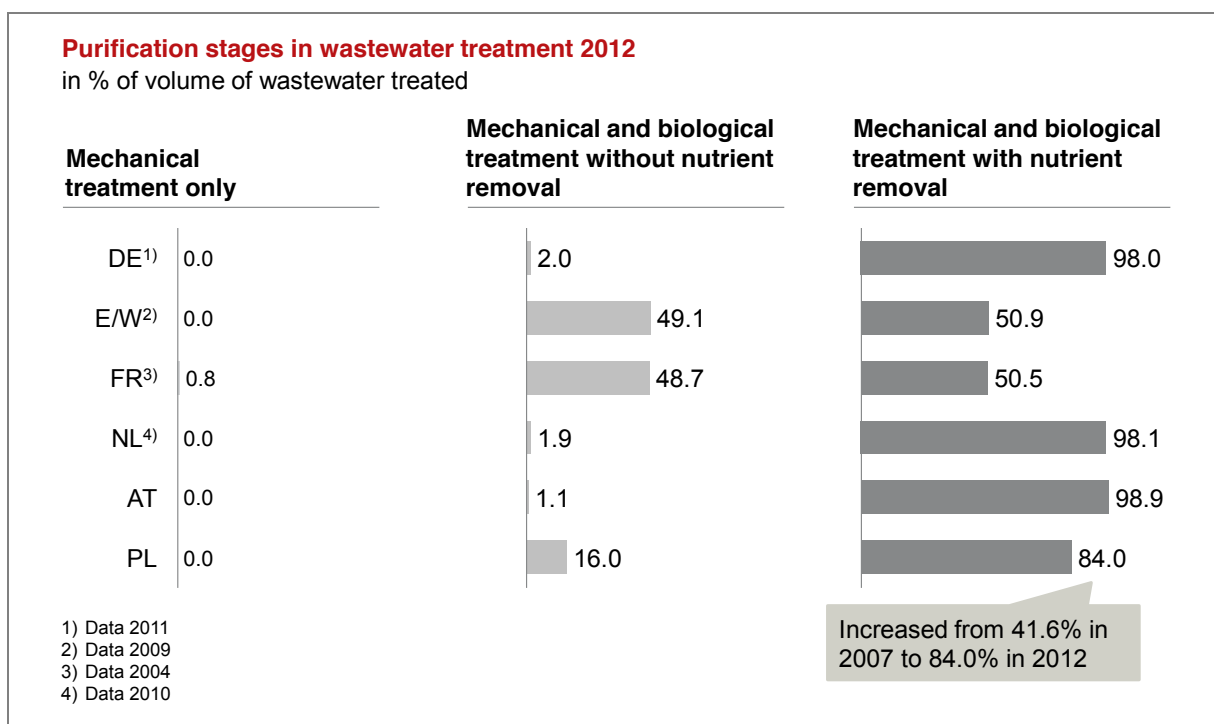


Fig. 23: Purification stages in wastewater treatment 2012⁶⁰

⁶⁰ Germany: German Federal Statistical Office, 2012, FS 19, Reihe 2.1.2, Tabelle 5.1; England/Wales and the Netherlands: OECD, Wastewater treatment tables; France: Ministry of Environment, Base de données Eider; Austria: BMLFUW, Urban Wastewater Directive of the EU – 91/271/EEG, 2012; Poland: GUS, Municipal Wastewater Treatment plants tables.

Whilst in Germany, the Netherlands and Austria almost the entire volume of wastewater is subject to a three-stage treatment, in England/Wales and France this only applies to (roughly) half of the volume of wastewater treated. Poland was able to double the proportion of the wastewater volume subject to the tertiary stage of treatment from 42% in 2007 to 84%.

Two important measured variables in respect of urban wastewater treatment are the removal of organic materials (measured as BOD5 or COD) and the removal of the nutrients nitrogen and phosphorus. As other pollutant parameters usually require a separate pre-treatment or final treatment at the point of origin, both according to the European Urban Wastewater Directive and German legal and enforcement practice, one can forgo representing other parameters for the results of the urban wastewater treatment.

The following comparison of the quality of wastewater treatment is limited to the parameters nitrogen and phosphorus.

The graph below shows the change in the concentration of nutrients emitted by treatment plants and sewers for Germany, the Netherlands, Austria and Poland. One can observe a clear reduction for the respective countries in the period 1990 to 2009. The data represents calculated values; the actual values could deviate from these (c.f. the values presented with a red line from the actual data collection). Nevertheless, they provide relative indications of the extent and quality of wastewater treatment.

The comparative values are included in the comparison of prices as they can be quantified as costs (See Sec. 6).

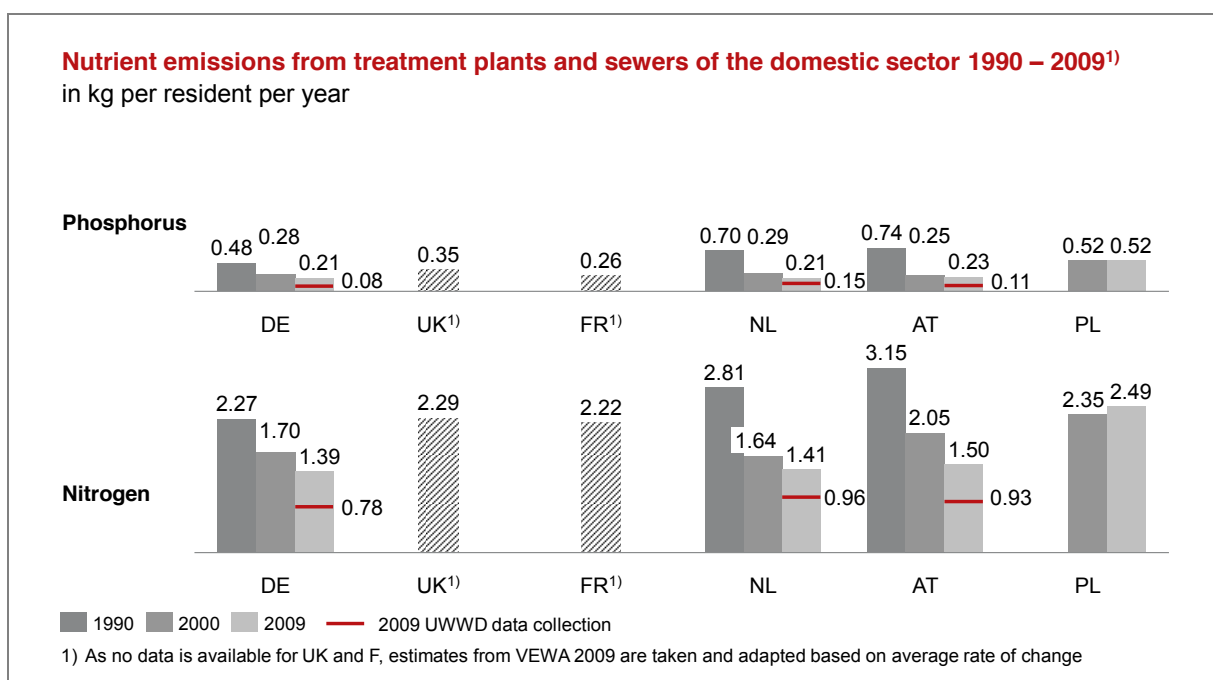


Fig. 24: Nutrient emissions from treatment plants and sewers of the domestic sector 1990 – 2009⁶¹

⁶¹ European Environmental Agency (website), http://www.eea.europa.eu/data-and-maps/daviz/phosphorus-emission-intensity-of-domestic-sector#tab-chart_2

The quality comparison in Section 7 analyses in greater detail further aspects of the quality of wastewater treatment in the countries in the comparison.

4.1.2 Network lengths and water losses

The term pipeline network (here, in a narrower sense for drinking water) is used to describe the sum of all pipes, not including domestic service pipes, which serves the public water supply of a built-up area. The public sewer network is understood to mean the entirety of the sewers, high-pressure sewer pipelines and associated buildings in a drainage area (as sanitary sewers for sewage and rainwater or as combined sewers).

The length of the pipeline network and sewer network in the countries in the comparison is very different. One striking aspect is that the sewer network in France is less than half as long as the drinking water network, whilst the connection rate to the sewer network is only 4% below that of the drinking water supply. This is due to the low settlement density in rural areas⁶².

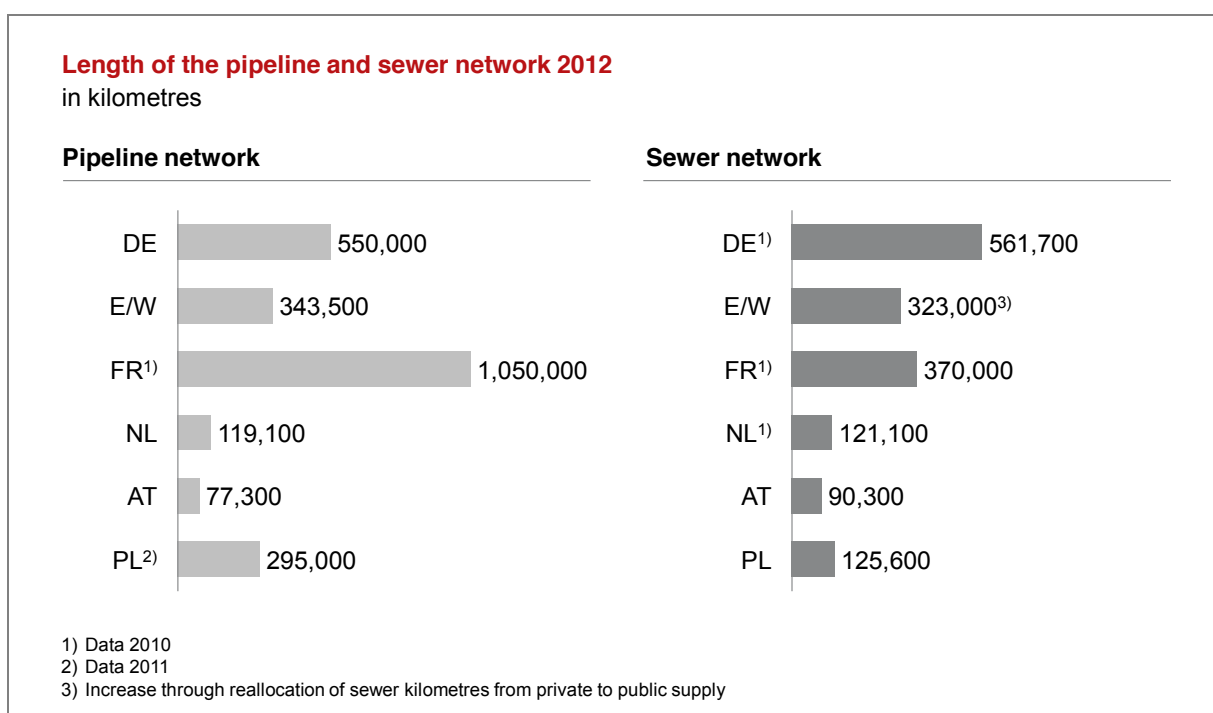


Fig. 25: Length of the pipeline and sewer network 2012⁶³

⁶² The length of the pipeline network shown above reflects the current official sources. According to Eaufrance, the values of the previous years were too low. The time series used in this study have been adjusted according to the new estimates. See Eaufrance, Observatoire des services publics d'eau et d'assainissement 2014.

⁶³ Note: changes compared to the previous study could be a result of changes in allocation of network pipes to the public network.

Germany: pipeline network: estimate BDEW, sewer network: German Federal Statistical Office, length of the sewer network tables; England/Wales: DEFRA, Drinking Water in England and Wales 2012 and Waste water treatment in the United Kingdom – 2012, p. 7; France: Eaufrance, Observatoire des services publics d'eau et d'assainissement p. 4, 2014; Netherlands: VEWIN (publisher), Drinking Water Fact Sheet 2012 und Drinking Water Statistics 2012; Austria: BMLFUW, website, existing sewers and water pipelines; Poland: GUS (publisher), regional database, municipal infrastructure in 2011 tables and Housing Economy and Municipal Infrastructure tables.

In Poland, there is a visible need for continued development of the network infrastructure. Between 2005 and 2015, the national development plan was to construct a total of 37,000 km of new sewers.⁶⁴ However, although the length of the sewer network almost quadrupled between 2000 and 2012, it is still far from reaching the length of the pipeline network.

The length of network per resident affects the level of water prices. The longer the network per resident is, the higher the costs per head are for connection and maintenance. The following chart shows an overview of the network length per connected resident. Due to the lower settlement density, the values in France and Austria are higher; in Poland they are comparably low because the connection rate is relatively low, especially in rural regions. In the case of the sewer network, the value for France is also relatively low, due to the low connection rate.

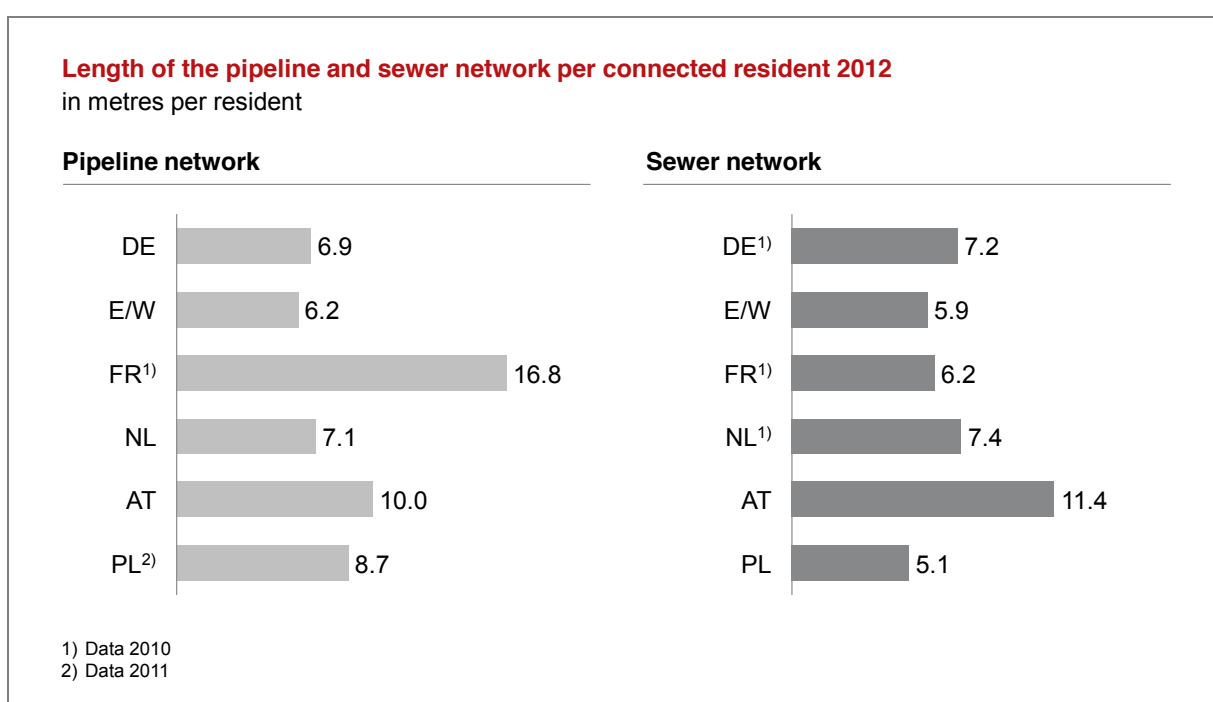


Fig. 26: Length of the pipeline and sewer network per connected resident 2012

Information on combined or sanitary sewers according to connected residents is available for Germany and Great Britain for the year 1997. Whilst 44% of connected residents in Germany used a separate system for sewage and rainwater, in Great Britain it was 30%. Today, the proportion of residents with a connection to a sanitary sewer in Germany is somewhat higher because, due to the already high connection rate by 1997, primarily new connections in thinly populated areas were added in which the connection owners were able to dispose of rainwater themselves, so that they only required a sewage disposal connection. In the Netherlands (status: 2012) 69% of residents are connected to combined systems, 26% to sanitary systems and 4% to high-pressure sewage pipelines.

Data is also available concerning the proportions of the sewer network length accounted for by each of the systems. In Germany in 2010, there were around 241,013 km of combined sewers (42.9%),

⁶⁴ Krajowego programu oczyszczania ścieków komunalnych (KPOSK) 2005.

199,631 km of sanitary sewers (35.6%) and 120,937 km of rainwater channels (21.5%)⁶⁵. In France also, the sanitary sewage system is gaining in share; the length of the sanitary system grew by around 8.3%⁶⁶ from 1998 to 2008. Measured according to the length of the sewer pipelines, 44% of the Dutch sewer network consists of combined systems and 33% of separated systems (of which 23% are only for sewage and 20% only for rainwater).⁶⁷ In Austria, there are around 24,000 km of combined sewers (27%), 56,000 km of sewage pipes (62%) and 10,300 km of rainwater channels (11%)⁶⁸. In the scope of new construction measures in Poland in the last ten years, on average 8% separate rainwater channels have been created, with this figure increasing in recent years. It was not possible to differentiate this number into combined and sanitary sewers.⁶⁹

The average water supplied or sewage volume per metre of pipeline or sewer network is calculated as a meter volume value. The higher the value, the greater the volume of water is supplied per metre of pipeline network or wastewater disposed per metre. A lower meter volume value is therefore an indicator of higher prices as the costs for maintaining the network must be divided by a lower volume of water. The following graphic shows the values in respect of the pipeline and sewer networks.

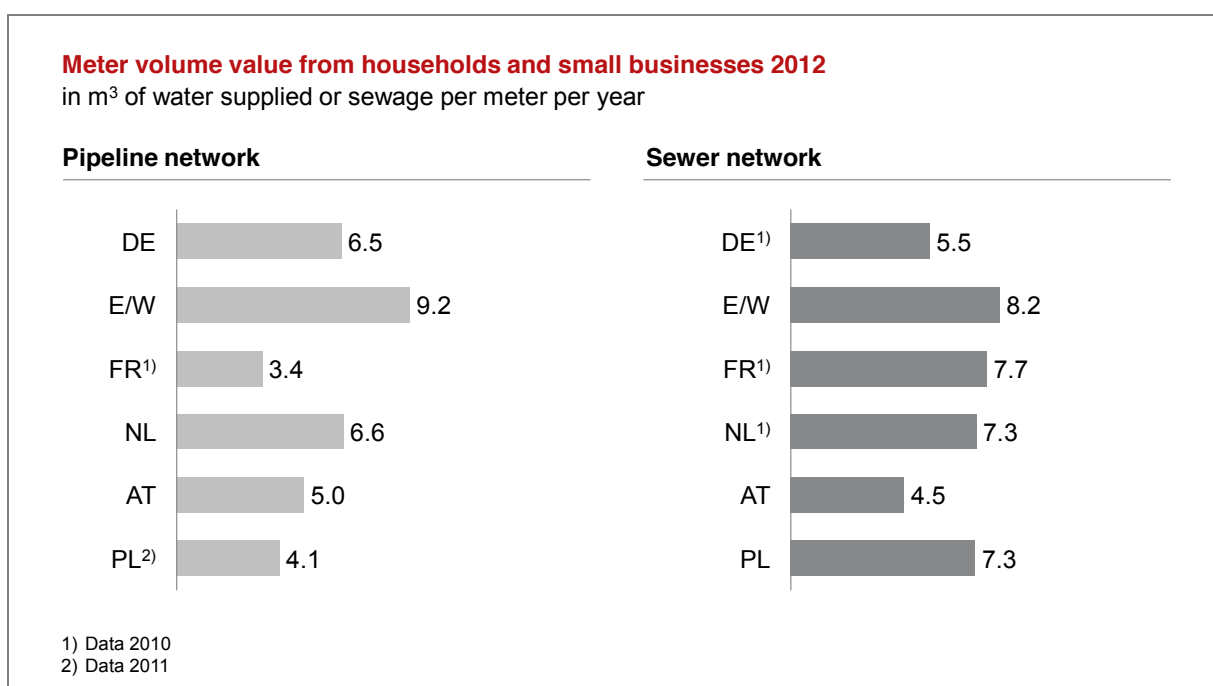


Fig. 27: Meter volume value from households and small businesses 2012

Usually, security of supply is measured through the frequency and duration of unplanned interruptions in supply. As no comparable data is available for the respective countries, we compare water losses as indicators of the condition of the networks.

⁶⁵ BDEW (publisher), Abwasserdaten Deutschland Strukturdaten und Entgelte der Abwasserentsorgung, 2014

⁶⁶ Ministry of Environment, Assainissement: la collecte des eaux usées et pluviales, website.

⁶⁷ VEWIN (publisher), Dutch Drinking Water Statistics 2012 p.44.

⁶⁸ BMLFUW, website, existing sewers and water pipelines.

⁶⁹ GUS (publisher), local data base.

Water losses in the sense of unmetered network supplies can be calculated as the difference between the volume of water abstracted and the supplied volume of water in relation to the water available. In this context, fire department use as well as process water and flushing water (to clean the network) is included in water losses in all countries.⁷⁰

In light of the high levels of investment required for maintaining the network, water losses in the public drinking water network are an important indicator of the quality of the networks and therefore of security of supply. The relative and absolute water losses are represented below.

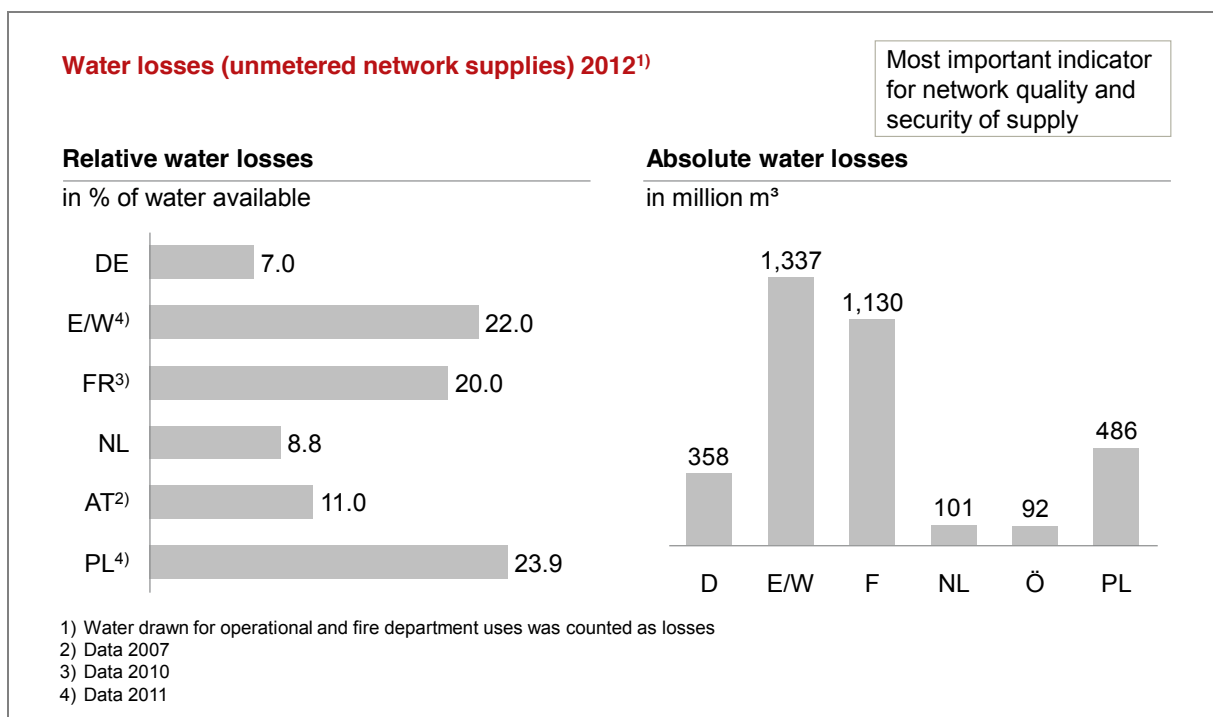


Fig. 28: Water losses (unmetered network supplies) 2012⁷¹

Germany and the Netherlands have by far the lowest levels of water losses, at 7% and just under 9% respectively. In contrast, in England/Wales and in Poland, almost a quarter of the water does not make it to the consumer; in France one fifth does not arrive. In Austria, the information is based on an estimated level of 10 – 12%.

Problems with water shortages have led to discussions in France and England/Wales about water losses and their causes. In this context, OFWAT set a target to reduce water losses by 9.5 million m³ per year until 2015. In order to achieve those reductions, substantial investment is planned.⁷² Since

⁷⁰ Water for firefighting accounts for around 2-3% of water losses in France, and for around 1.5% in England/Wales. No information is available for Germany or other countries.

⁷¹ Germany: BDEW Expert estimates; England/Wales: DEFRA, Distribution input and supply pipe leakage tables; France: Eaufrance: Observatoire des services publics d'eau et d'assainissement 2014, p. 115; Netherlands: calculation on basis of VEWIN, Drinking Water Fact Sheet 2013; Austria: estimate ÖVGW; Poland: own calculations, information from the literature, approx. 25% – e.g. in Inspection for Environmental Protection, The State of environment in Poland 1996-2001, Warsaw 2003.

⁷² U.K. water companies invest in metering, 2009.

then, OFWAT has stated its target to be a sustainable, economic level of water losses taking into account social and environmental costs and benefits.⁷³

Another way of looking at the quality of the distribution networks are specific water losses. This figure brings together water losses, as the difference between water abstraction and water supplied, with the length of the pipeline network.

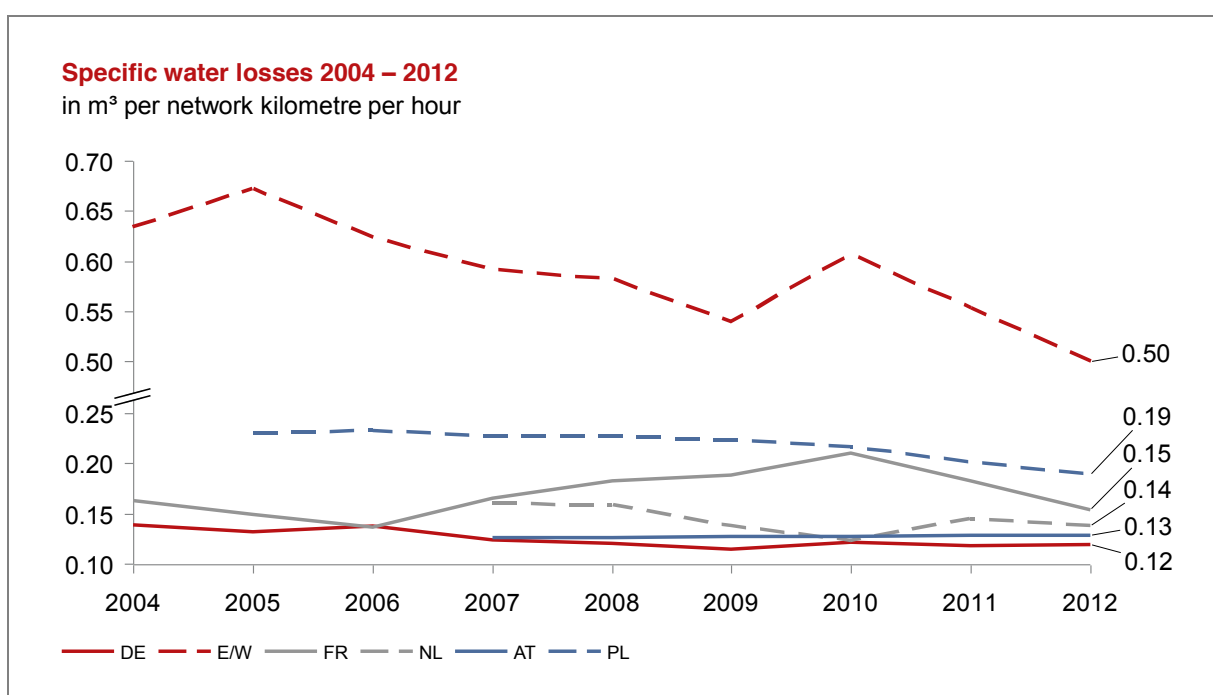


Fig. 29: Specific water losses 2004 – 2012⁷⁴

If one relates water losses to the length of the pipeline network, France and Poland are closer to the countries with lower relative water losses. Only England/Wales remains considerably above the other countries in the comparison. The above graph shows that all countries in the comparison, with the exception of England/Wales, have specific losses between 0.12 and 0.19 m³ per kilometre of pipeline network per hour. The value for England, at 0.50 m³ per kilometre of pipeline network per hour, is considerably higher.

4.1.3 Value of the infrastructure

The value of the existing infrastructure of the water supply and wastewater disposal systems, refers, in this context, to the total value at replacement cost of the public pipeline and sewer networks, waterworks, wastewater treatment plants as well as other plants. The availability of data regarding the value of the infrastructure varies greatly between the countries in the comparison.

⁷³ OFWAT, Website, <http://www.ofwat.gov.uk/consumerissues/rightsresponsibilities/leakage/>

⁷⁴ Own calculation from the difference between abstracted and delivered freshwater in relation to the respective network lengths

No reliable data is available on the total value of the pipeline network in Germany. The value was therefore estimated in the 2006 study on the basis of the benchmarking exercises in Bavaria, Hesse and Thuringia, which provided data on the value per metre (approx. €189) for 2003, whilst taking into account the nationwide population density.⁷⁵ Multiplied by the length of the pipeline network, this produced an asset value for the pipeline network of around €97.3 billion for 2003. Extrapolating from those figures, the value for 2012 was determined as follows: one metre of the pipeline network costs €223; the asset value of the entire pipeline network therefore amounts to €122.4 billion. The value of the entire infrastructure, including waterworks and other plants is estimated at around €171 billion.⁷⁶

In **England/Wales** the extrapolated asset value of the infrastructure is calculated to be €131 billion, of which the pipeline network comprises €113 billion.⁷⁷

In **France** the value of the infrastructure for 2003 was calculated in a study on cost recovery in the water industry. If one extrapolates from the value in that study (€118 per metre of pipeline network for 2003⁷⁸) with investments and depreciation to 2012, one arrives at a value of €138 per metre. This agrees with the other publications⁷⁹. The main reason for the low costs per metre are the laying costs of under €100 per metre for municipalities with under 2,000 residents (23% of the population). Multiplying the value with the length of the pipeline network⁸⁰, results in a value of the pipeline network in the amount of €145 billion. The entire infrastructure has a value of around €224 billion.

For the **Netherlands**, VEWIN was only able to ascertain the value of the infrastructure of the pipeline network for 2005, on the basis of their own calculations, which it stated as almost €10 billion. An extrapolation, taking into account inflation and network expansion, produces a value for 2012 of around €11 billion. The low replacement value of the network – it amounts to €92 per metre – is a result, according to the Water Association, of the consistent use of the low-priced material PVC when adding or replacing sections of the network. Today, around half of the entire pipeline system consists of PVC.⁸¹

In **Austria**, the value of the pipeline network is estimated to be €206 per metre.⁸² This leads to an asset value of €16 billion for the entire pipeline network. Information on plants is not available.

Similarly in **Poland**, only the value of the infrastructure of the pipeline networks could be ascertained. This was achieved by estimating the average construction cost per metre (€305⁸³ after adjustment for price level on the basis of purchasing power parity) and multiplying this by the length of the network. In

⁷⁵ Rödl & Partner, Benchmarking der Wasserversorgung in Hessen, 2005; Benchmarking der Wasserversorgung in Thüringen, 2003; Effizienz- und Qualitätsuntersuchung der kommunalen Wasserversorgung in Bayern, 2004.

⁷⁶ Hannover Messe (publisher), Ohne Rohrleitungsnetze läuft nichts, 2006; own calculation

⁷⁷ OFWAT, Financial Performance and Expenditure report 2009-10, p. 23. Extrapolated to 2012 taking into account network expansion

⁷⁸ Ernst & Young, Etude relative au calcul de la récupération des coûts, 2004, p. 39/131, 10/13.

⁷⁹ E.g. the Agences de l'eau specify a value of €120 per metre for 2009 (c.f. Le rudement des réseaux d'eau potable, 2009).

⁸⁰ The basis for this calculation is the length given by the Ministry of Environment for the pipeline network of around 1,050,000 km. The figures in the Ernst & Young study deviate from these figures.

⁸¹ VEWIN (publisher), Drinking water fact sheet 2013, p. 8.

⁸² Extrapolation based on Austrian Association for Gas and Water, Expert Committee on Economic Issues in Water

⁸³ Expert conversation with Ms. Kasperczyk, PWiK sp. z o.o Dąbrowa Górnicza.

that calculation, the varying pipe cross sections were taken into account in respect of the proportion in the entire system.

The following graph summarises the value at replacement cost of the infrastructure of the public pipeline network for the water supply.

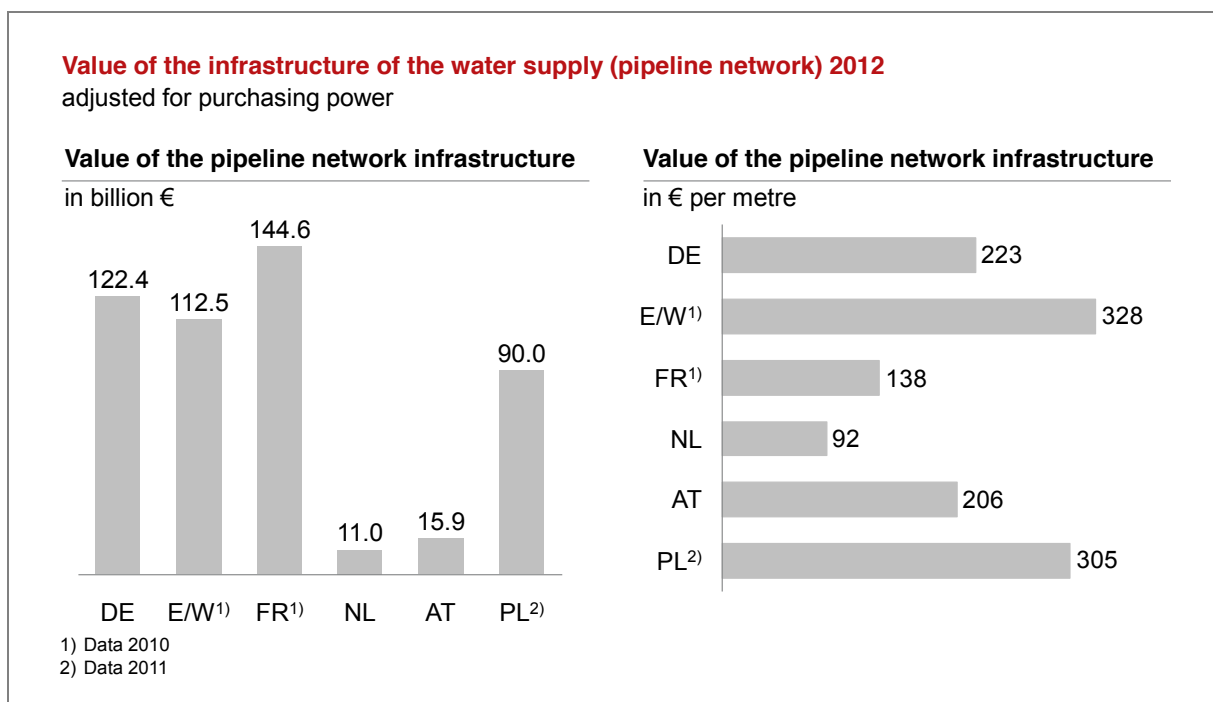


Fig. 30: Value of the infrastructure of the water supply (pipeline network) 2012⁸⁴

There are also estimates for the value of the wastewater infrastructure.

On the basis of a survey as well as scientific publications, the value of the public **sewer network** in **Germany** was estimated via manufacturers' costs per metre of sewer (€708 per metre). Multiplied by the length of the sewer network, this produces a total asset value for the network of around €398 billion. As such, the value is at the lower end of the range usually given of €400 – 500 billion. The asset value of the wastewater treatment plants at replacement value is estimated to be around €271 billion.⁸⁵

In **England/Wales** the total value of the wastewater infrastructure is stated as €230 billion, of which the sewer network comprises €202 billion.⁸⁶

⁸⁴ Germany: Rödl & Partner, Benchmarking der Wasserversorgung in Hessen, 2005; Benchmarking der Wasserversorgung in Thüringen, 2003; Effizienz- und Qualitätsuntersuchung der kommunalen Wasserversorgung in Bayern, 2004; own calculation; England/Wales: OFWAT, Financial Performance 2007/08 France: Ernst & Young, Etude relative au calcul de la récupération des coûts, 2004, p. 39/131, 10/13, own calculation; Netherlands: calculations from VEWIN, expert conversation; Austria: Austrian Association for Gas and Water, Expert Committee on Economic Issues in Water, own calculation; Poland: own calculations on the basis of expert conversations and analysis of individual water companies in Poland.

⁸⁵ DWA, Zustand der Kanalisation in Deutschland, 2005, own calculation and extrapolation; Pinnekamp in EUWID Wasser und Abwasser, 40.2013.

⁸⁶ OFWAT, Financial Performance and Expenditure report 2009-10, p. 23. Extrapolated to 2012 taking into account network expansion

In **France**, multiplying the value per metre of sewer (€319 per metre) with the length of the sewer network produces a value for the network as a whole of €118 billion. The source here is once more a study on the degree of cost recovery of the French wastewater industry, which was then extrapolated. The calculation of the value was performed using a weighted average of laying costs in rural and urban areas. The total value of the infrastructure is estimated at €161 billion.⁸⁷

For the **Netherlands**, the value of the sewer network is stated at around €80 billion for 2012.⁸⁸ The value of the treatment plants is calculated at €10 billion.⁸⁹ For both infrastructures together, the sum of the values is therefore €90 billion.

In **Austria** an estimate of the total value of the infrastructure is available, which amounts to €70 billion for the sewer network and treatment plants. To reach that figure, the value of the sewer network was estimated, on the basis of an average value of €653 per metre of sewer, to be around €59 billion. The average value comprises an estimated €200 – 250 per metre in rural areas and €400 – 1,200 in urban areas (not including Vienna), weighted according to the proportion of the population that lives in rural and in urban areas.⁹⁰ The value of the treatment works was estimated to be €11 billion. The basis for that was the expansion capacity of a population equivalent of 21 million (status: 2006) and average investment costs of around €370 per population equivalent (status: 1997 – 2000). An analysis of around 300 applications for aid in the period 1997 – 2000 reveals, depending on the size class, investment costs of €1,500 per p.e. (50 p.e.), €900 per p.e. (500 p.e.), €440 per p.e. (5,000 p.e.) and €350 per p.e. (50,000 p.e.). The average value used is derived from the weighting with the design capacity for each size class.⁹¹

In **Poland**, the value of the sewer network was calculated by estimating the average construction cost per metre (€558 after adjustment of the currency and the purchasing price level⁹²) and multiplying it with the length of the network, which produced a figure of €70 billion. The value of all wastewater treatment plants was calculated using an analysis of the newly constructed plants in the last few years multiplied by the number of plants available in 2007 – the value thus ascertained was €17 billion.⁹³ A lack of precision can arise in this respect as the individual treatment plants have very different capacities and it is sometimes difficult to differentiate between new builds and expansions. In total, the estimated value for the sewer network and treatment plants together amounts to just under €87 billion.

The asset value of the sewer network for wastewater disposal is summarised in the following graphic.

⁸⁷ Ernst & Young, Etude relative au calcul de la récupération des coûts, 2004, p. 35/131, 5/12, own calculation

⁸⁸ Rioned

⁸⁹ Calculation after a conversation with the Unie van Waterschappen (Dutch Association of Regional Water Authorities) plus an extrapolation taking into account the development of the sewer network

⁹⁰ ÖWAV expert conversation, 2010 and extrapolations based on that.

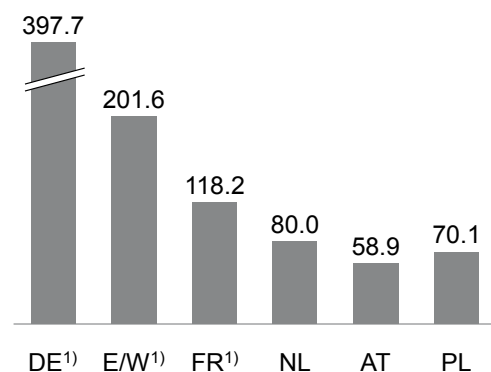
⁹¹ Report on the implementation of the Urban Wastewater Treatment Directive, 2008; economic analysis of water use, 2003; own calculation.

⁹² Expert conversation with Ms. Kasperczyk, PWiK sp. z o.o. Dąbrowa Górnicza and extrapolations based on that.

⁹³ GUS (publisher): local data base and own calculations.

Value of the wastewater disposal infrastructure (sewer network) 2012
adjusted for purchasing power

Value of the sewer network infrastructure
in billion €



1) Data 2010

Value of the sewer network infrastructure
in € per metre



Fig. 31: Value of the wastewater disposal infrastructure (sewer network) 2012⁹⁴

It can be seen that the average costs for the construction of a metre of sewer network in France is substantially lower than for the other countries in the comparison. This difference is due, amongst other things, to the rural settlement structure of France.

The value of the network infrastructure feeds into the calculation of the renewal rate which follows from the relationship between the annual sum of replacement investment plus maintenance and the value of the infrastructure (see Section 6; price comparison level III).

4.2 Investments

Investments are an important parameter for quality and costs of water supply and wastewater disposal.

4.2.1 Level of and development of investments

Germany has the highest level of average annual investment for the period 1995 – 2012, at €8.8 billion, which can be explained by the size of the German market. After the overview in the graphic below, the countries are looked at individually.

⁹⁴ Germany: DWA, Zustand der Kanalisation in Deutschland Pinnekamp in EUWID Wasser und Abwasser, 40.2013; England/Wales: OFWAT, Financial Performance 2009/10; France: Ernst & Young, Etude relative au calcul de la récupération des coûts, 2004, p. 35/131, 5/12; Netherlands: Rioned (publisher), Urban drainage statistics 2009-10, and expert estimates; Austria: ÖWAV expert conversation, own calculation; Poland: expert conversation PWiK sp. z o.o Dąbrowa Górnicza.

Average investment for drinking water and wastewater 1995 – 2012
in billion € per year, price indexed and adjusted for purchasing power

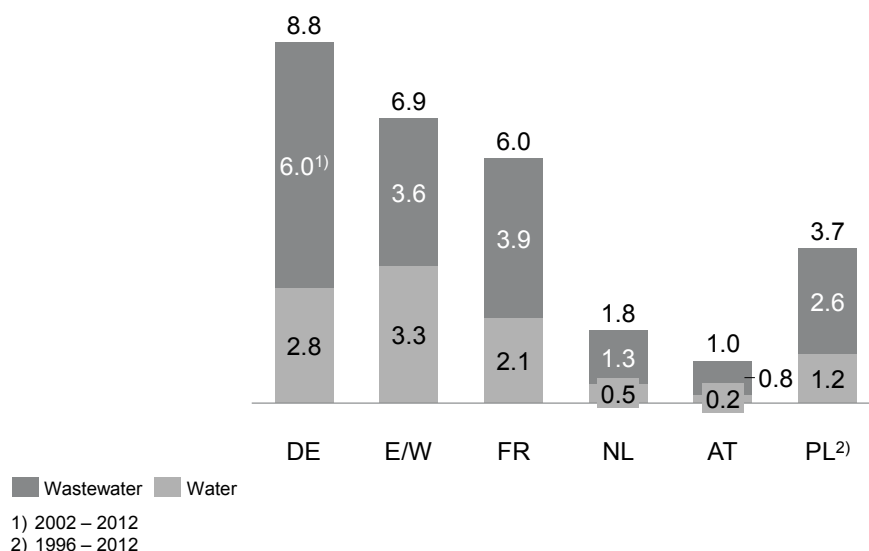


Fig. 32: Average investment for drinking water and wastewater 1995 – 2012⁹⁵

In **Germany** investment in the water and wastewater infrastructure, at between €6 billion and €12.3 billion in recent years, has been much higher than in the other countries in the comparison.

Development of investment in Germany 1995 – 2012

in billion € per year, price indexed and adjusted for purchasing power

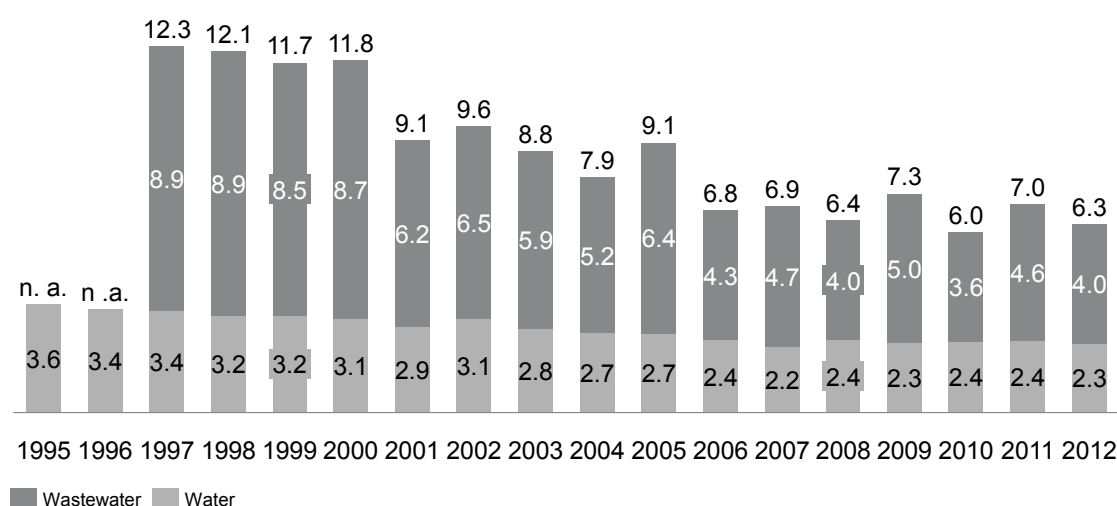


Fig. 33: Development of investment in Germany, 1995 – 2012⁹⁶

⁹⁵ C.f. Source references on the following figures.

⁹⁶ BGW/BDEW Water Statistics 2000, 2001, 2002, 2003, 2007, 2009, 2010, 2011 and 2012, Table 2.4.2; BGW/ATV-DWK Market Data for Wastewater 2003 and DWA Economic data and wastewater disposal 2005, 2007, 2009 and 2011.

In the period 1990 – 2000, the level of investment was higher than before reunification due to the initially substantial need to bring the new Länder's system, especially wastewater disposal, up to date⁹⁷. Today, the connection rate to wastewater treatment plants has risen to a nationwide level of 96%. As companies in the new Länder only constitute a small part of the total German investment, the fluctuations have a limited effect. In the area of water supply, the proportion of investment which fell in the new Länder in 2012 was 27% and the proportion in the old Länder was 73%. The proportion rose from 1995 to 2005 from around 70% to 80% before falling slightly.⁹⁸ In the area of wastewater disposal, the proportion of investment made in the new Länder fluctuated from 1997 to 2007 between 20% and 29%.⁹⁹

In **England** (graphic below) the investments, the planning of which must be approved by OFWAT in the scope of price regulation, fluctuate in a five year cycle. In the years after privatisation, a high level of investment was made in order to work off the investment backlog. When assessing the English investment level, it must be taken into account that privatisation in 1989 was undertaken under the premise that the investment backlog would be remedied through a substantial increase in investment. For this reason, the companies were granted considerable benefits through the so-called green dowry as well as tax relief.¹⁰⁰

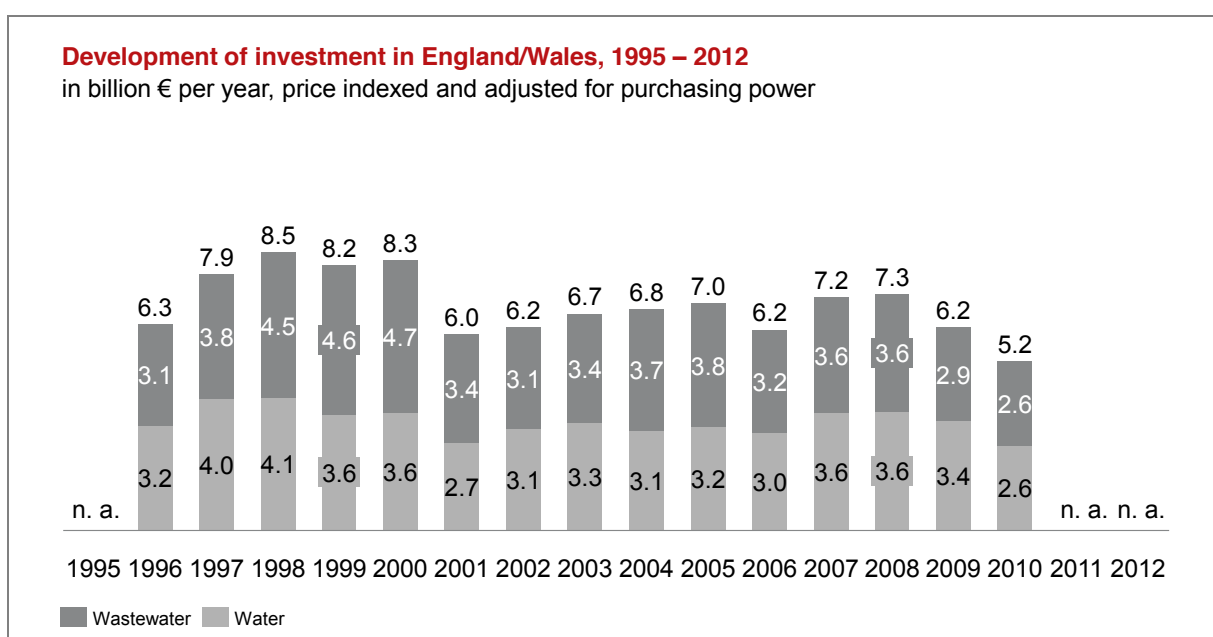


Fig. 34: Development of investment in England/Wales, 1995 – 2012¹⁰¹

⁹⁷ The German Institute for Economic Research calculated in 2001 that the need to bring the local drainage, water and energy supply up to date would cost €115 billion, whereby the large part of that sum can certainly be attributed to the energy supply.

⁹⁸ BDEW Wasserstatistik 2012, Table 2.4.

⁹⁹ Reidenbach/Schneider (Difu), Wasserversorgung und Abwasserbeseitigung, 21 April 2010, slides 14 and 15.

¹⁰⁰ See Section on grants and level II of water and wastewater price comparison.

¹⁰¹ OFWAT, Financial Performance 1999/2000, 2000/01, 2001/02, 2002/03, 2003/04, 2007/08, 2009/2010

For the current approval cycle up to 2015, total investments of GBP 22 billion are planned for maintenance and improvements in water supply and wastewater disposal. In order to finance this investment, water prices are to rise considerably.¹⁰²

In **France** (graphic below) investment continuously increased, in particular in wastewater disposal, until 2009.

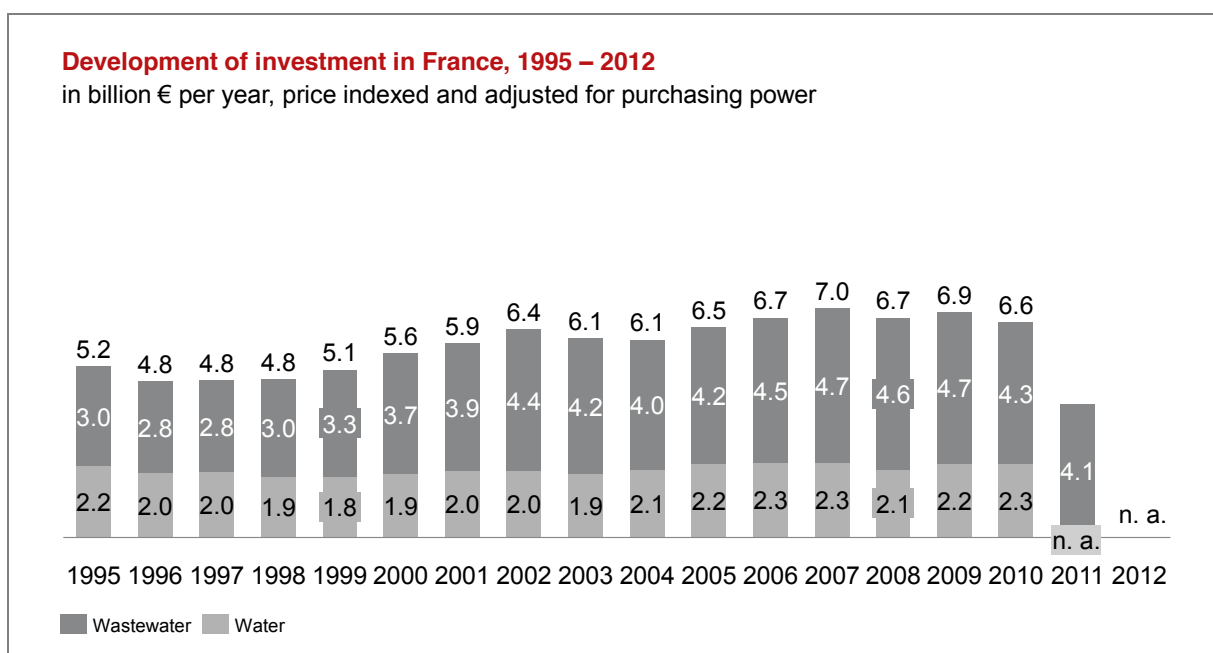


Fig. 35: Development of investment in France, 1995 – 2012¹⁰³

In the **Netherlands** (graphic below) investment has fallen slightly in recent years.

¹⁰² OFWAT, Delivering sustainable water, OFWAT's strategy, 2010.

¹⁰³ Ministry of Environment, Les Comptes Économiques de l'Environnement en 2005, 2007, 2010 as well as 2011.

Development of investment in the Netherlands 1995 – 2012

in billion € per year, price indexed and adjusted for purchasing power

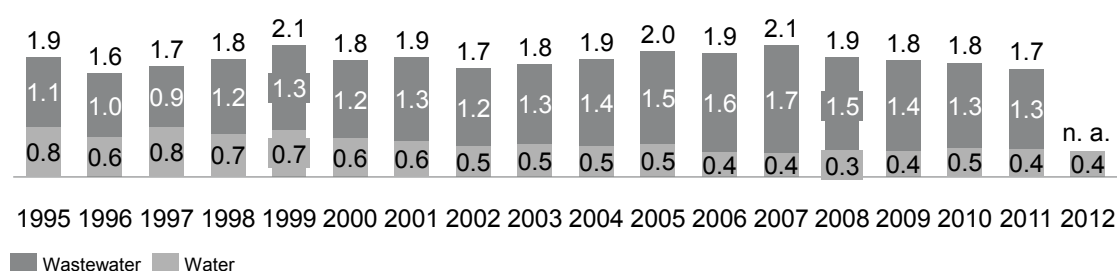


Fig. 36: Development of investment in the Netherlands 1995 – 2012¹⁰⁴

VEWIN explains the development with the reduction in water use meaning that hardly any expansion of production capacity was needed. Investments were made in improving water treatment, to increase water quality as well as in expanding the pipeline network.¹⁰⁵ In contrast, investment in the area of wastewater increased continuously to 2007. Investment was made primarily in the sewer network, where combined systems were often replaced by sanitary sewers due to an increase in heavy rainfall events.¹⁰⁶ In recent years, a decline has been observed. Rioned explains this with constant (not increasing) maintenance and replacement costs¹⁰⁷.

In **Austria** (graphic below) only subsidised investments are statistically recorded whereby grants are utilised for a large proportion of investments in the area of water supply. Investments without grants are presumably substantial, however their amount can only be partially estimated. For non-subsidised upgrades in the water supply from 2001 to 2012, a proportion of approx. 15 – 20% was added. In the area of wastewater, hardly any investment was made without grants, meaning that the data is almost complete in this respect. The graphic shows the investments actually brought to account in each case.¹⁰⁸

¹⁰⁴ VEWIN (publisher), Water supply statistics, expenditure 2000 to 2007; VEWIN (publisher), Drinking Water Fact Sheet 2013; CBS Statline (publisher) Database.

¹⁰⁵ VEWIN (publisher), Drinking Water Statistics 2012, p. 37.

¹⁰⁶ Rioned (publisher), Onderzoek regenwateroverlast in de bebouwde omgeving, August 2007.

¹⁰⁷ Rioned (publisher), Riolerings in beeld, November 2013.

¹⁰⁸ Conversations with experts, ÖVGW and KPC.

Development of investment in Austria 1995 – 2012¹⁾

in billion € per year, price indexed and adjusted for purchasing power

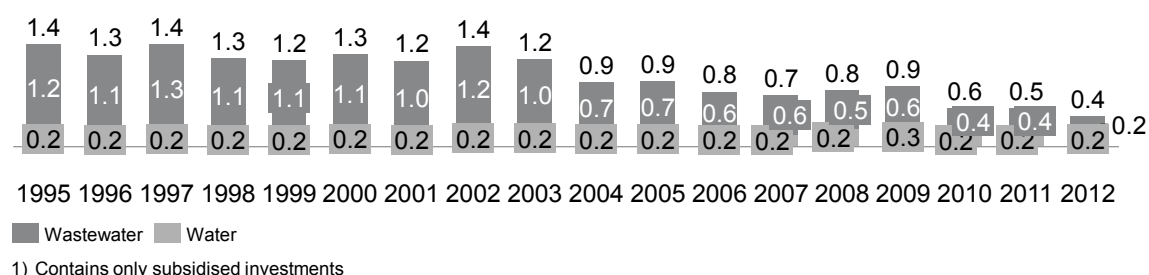


Fig. 37: Development of investment in Austria, 1995 – 2012¹⁰⁹

In the area of water supply, in which the connection rate was increased from 86% in 1995 to 92% to-day, investment remained relatively constant. In the area of wastewater disposal, amounts invested have been falling in recent years, following high levels of investment in the past. A large part of the investment was used for the improvement of the connection rate, which has been increased from 76% in 1995 to 95% today.

In **Poland** (graphic below) investment has been and still is characterised by a substantial need to catch up to the level of other countries, which has arisen since the country was opened up at the beginning of the 1990s. At that time, the infrastructure was in a desperate condition; environmental protection measures were rarely if ever practised. At the point of Poland's accession to the EU in 2004, it was clear that to meet the European directives, large sums would have to be invested, especially in the area of wastewater. Helped by increased grants from the EU (see Section 5.3.2), investment increased again. The Polish authorities planned to spend a total of 31.9 billion zlotys (around €8.4 billion) in the period from 2007 to 2015 for the expansion of the wastewater infrastructure, thus a good €1 billion per year.¹¹⁰ In addition to that, they projected around 10 billion zlotys (around €2.6 billion) for measures in water treatment and distribution. Other forecasts assume a required total volume of investment of 70 billion zlotys (approx. €18.4 billion) by 2015.¹¹¹ In the period from 2007 to 2012, these values were exceeded, hence €23.7 billion (in 2012 prices) was invested.

¹⁰⁹ Expert conversation, KPC, 2014.

¹¹⁰ Aktualizacja Krajowego programu oczyszczania ścieków komunalnych (AKPOSK) 2009, Warsaw, February 2010.

¹¹¹ According to, for example, the Polish Ministry of Economy (source: Germany Trade & Invest, 10 July 2009).

Development of investment in Poland, 1995 – 2012

in billion € per year, price indexed and adjusted for purchasing power

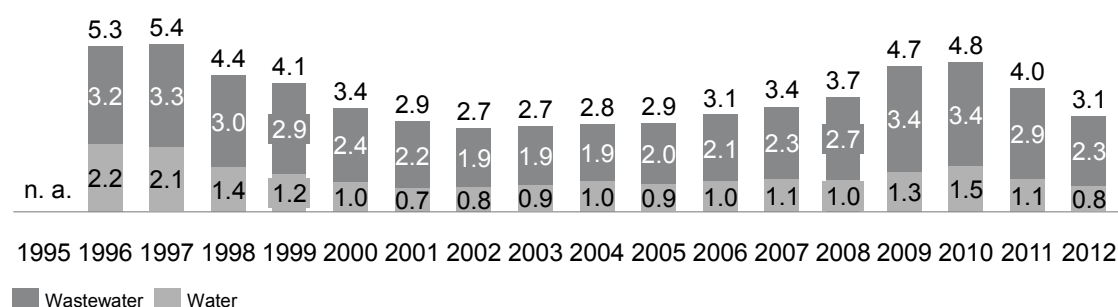


Fig. 38: Development of investment in Poland, 1995 – 2012¹¹²

By presenting investment in relation to the volume of water supplied or sewage removed, the absolute values are made comparable.

Whilst investment in the water supply in Germany is still at a high average level of €0.59 per m³, today investment in England/Wales and Poland has risen to €0.78 and €0.70 per m³ respectively.

In the case of wastewater disposal, the average investment in Germany is in the middle of the range. The value for France is today on a similar level whilst in England/Wales a decline was recorded. Austria remains high and the Polish value of €1.86 also shows clearly that there is still a great need to bring the system in that country up to date.

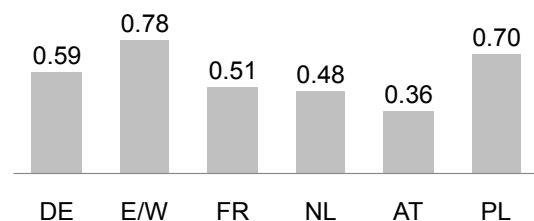
¹¹² OECD, Environmental Performance Reviews, p. 65; GUS Regional database.

Average investment per cubic metre 1995 – 2012¹⁾

price indexed and adjusted for purchasing power

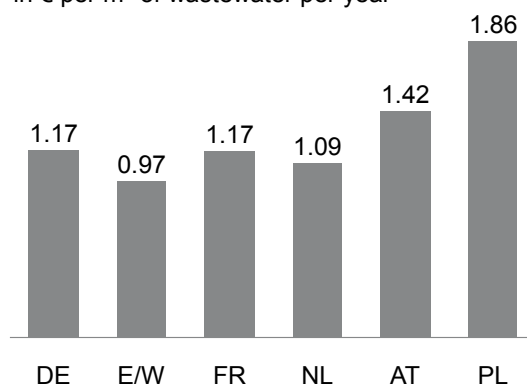
Water supply

in € per m³ of water supplied per year



Wastewater disposal

in € per m³ of wastewater per year



1) Average figures have been calculated using available data on investments and water volumes

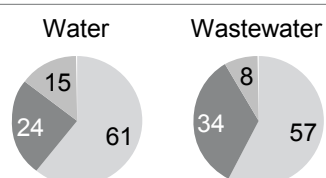
Fig. 39: Average investment per cubic metre 1995 – 2012

The following graphic shows the division of investment between the water and wastewater infrastructures.

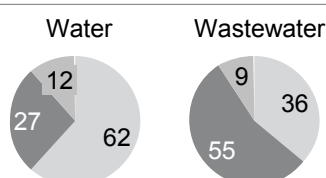
Distribution of investment 1995 – 2012 in infrastructure

in % of total investment

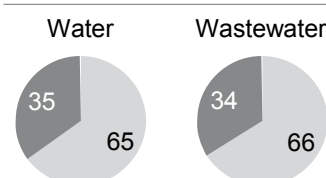
Germany



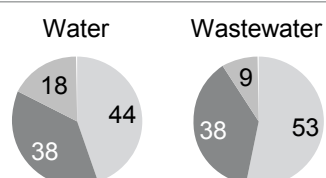
England/Wales



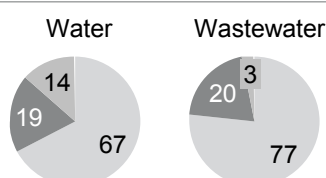
France¹⁾



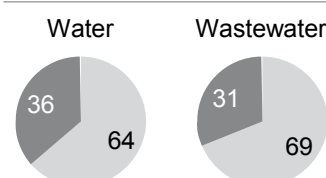
Netherlands



Austria



Poland¹⁾



Legend: Pipeline or sewer network (light grey), Water works or treatment plants (dark grey), Other (medium grey)

1) No data on "other investments" available

Fig. 40: Distribution of investment 1995 – 2012 in infrastructure

The following graphic shows the relation between investment and water price.

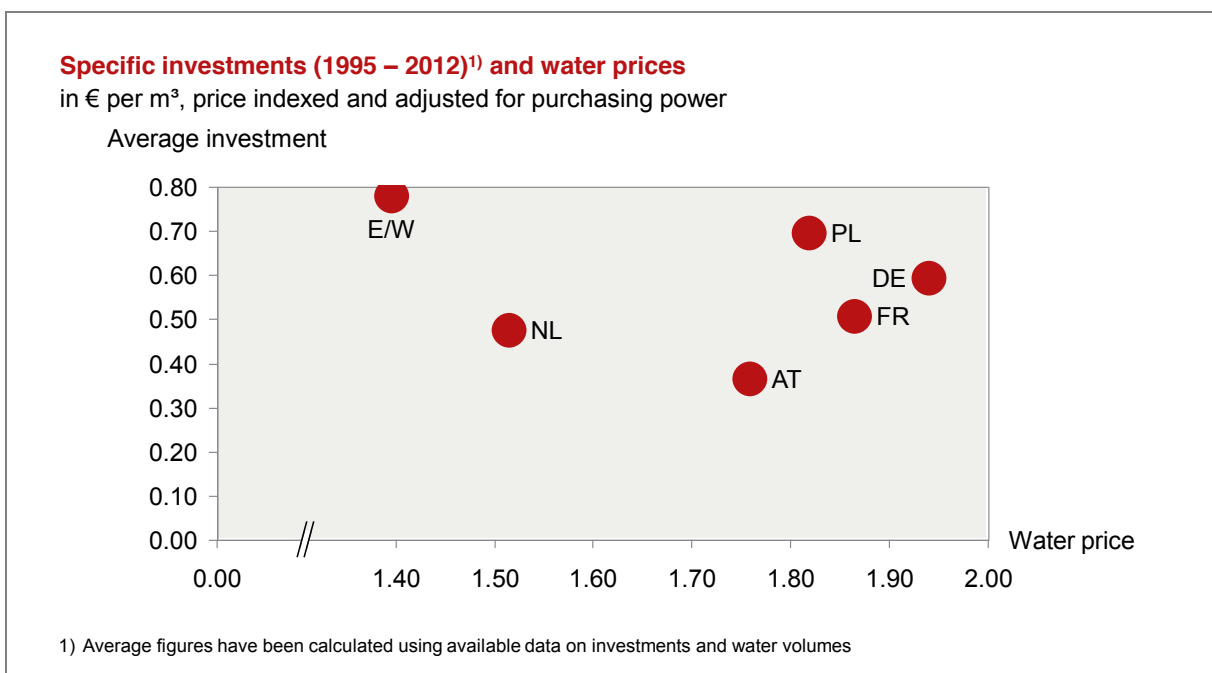


Fig. 41: Specific investment (1995 – 2012) and water prices

In the area of wastewater disposal, one can see a trend that countries with higher levels of investment also demand higher wastewater prices (see graphic below).

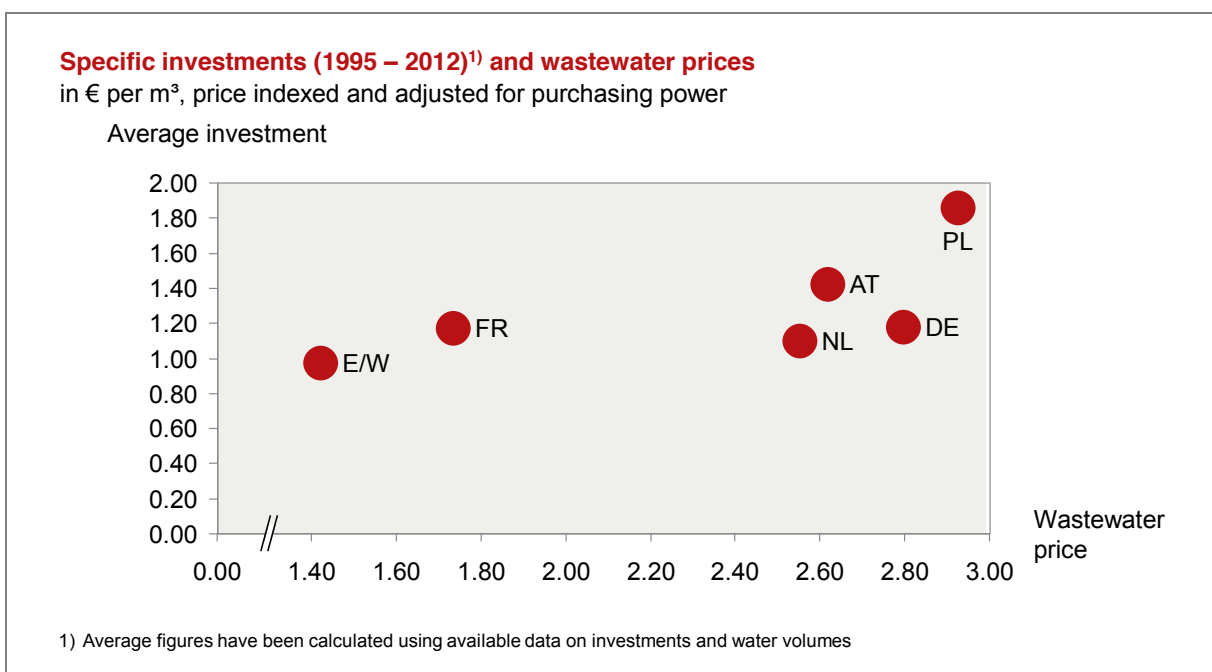


Fig. 42: Specific investment (1995 – 2012) and wastewater prices

As far as investment is concerned, there are two problems regarding this price comparison:

- When renewing plants, in particular networks, there is no harmonised delineation between investment and maintenance expenditure. As such, the renewal of networks up to a length of several hundred metres or in conjunction with a reduction of the diameter of pipes can be classed as maintenance. As this maintenance expenditure is recorded as an operating cost and no data is available on this, the costs for renewal cannot be ascertained with any precision but can only be estimated.
- The influence of investment on expenditure cannot be clearly determined in the countries in the comparison, as information on depreciation periods and depreciation types, usage periods and calculated interest rates cannot be determined or reliably estimated. Only for France is there a study from 2004 which – in place of depreciation – estimated in detail the consommation de capitale fixe.¹¹³

4.2.2 Investment and preservation of assets

Investment in the pipeline and sewer network can be divided into renewal and expansion investment. Whilst expansion investment serves the construction of additional network capacity, renewal investment relates to the renewal of existing assets. In order to answer the question as to how sustainable the water suppliers and wastewater disposal providers are investing in their networks, it makes sense to estimate renewal investment as only that will preserve the quality of the existing networks.

The estimated division of average investment from 1995 to 2012 into expansion and renewal investment is shown in the graphic below for the pipeline and sewer networks.

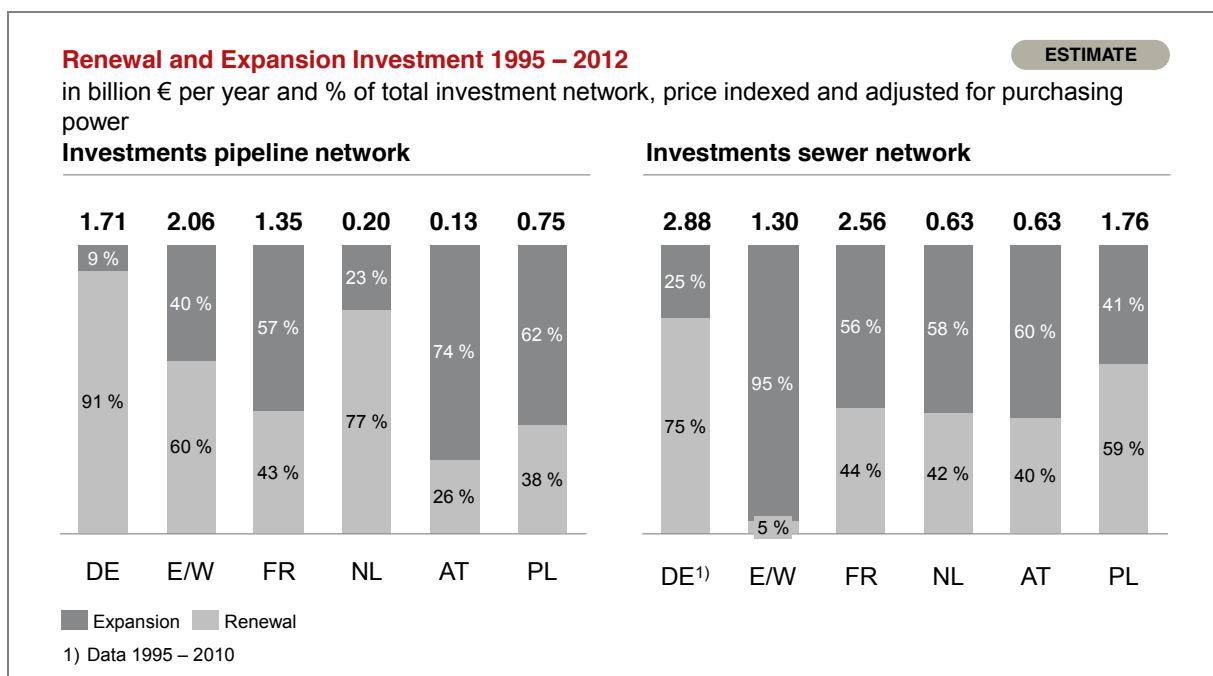


Fig. 43: Renewal and expansion investment 1995 – 2012¹¹⁴

¹¹³ Ernst & Young, Etude relative au calcul de la récupération des coûts, Section 4, 2004.

¹¹⁴ Own calculation.

Due to the inadequate data available, the estimate of renewal and expansion investment has been based on the following assumption: expansion investment is defined as the investment necessary to connect additional residents. Factors which are relevant in this context are the change in connection rate in a particular period, the change in total population of a country and the cost per newly constructed metre of pipeline or sewer.

The analysis reveals a mixed picture: some countries invest more heavily in renewal, others in the expansion of networks. In the area of wastewater disposal, however, the focus of investment was in the expansion of the sewer network in all countries except Germany and Poland.

In order to compare the sustainability of network renewal, renewal investment in the pipeline network and sewer network as well as maintenance expenditure are considered. In relation to the asset value of the network, a sustainability coefficient is calculated which gives an indication as to the differences in preservation of assets.

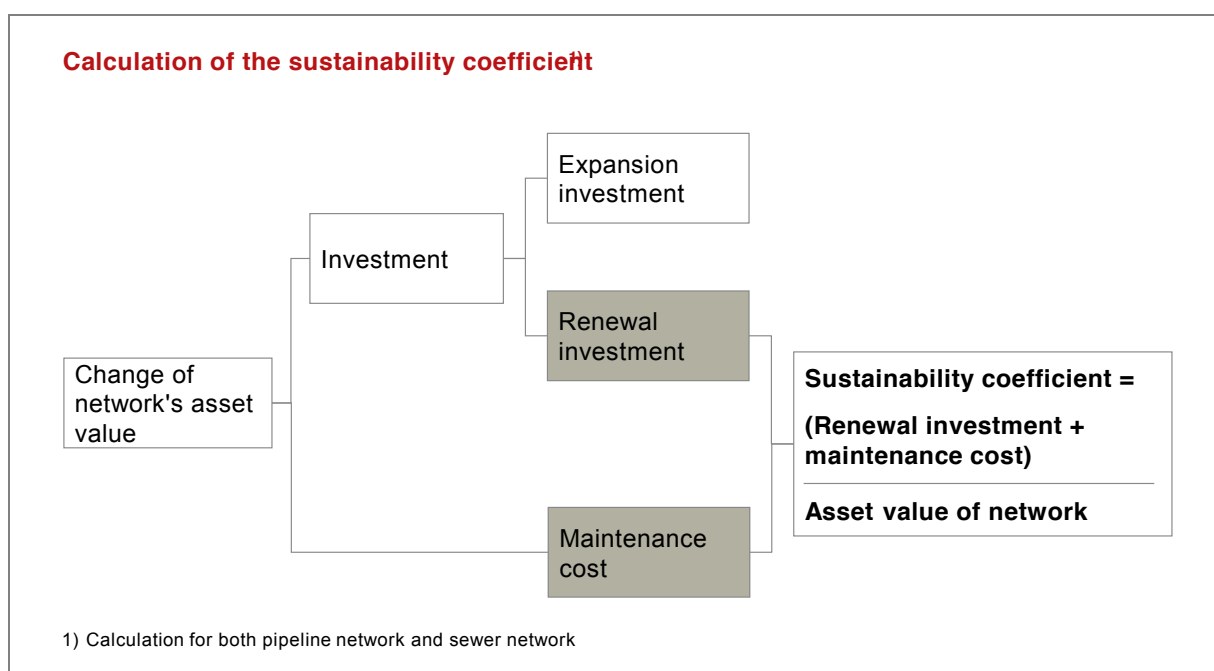


Fig. 44: Calculation of the sustainability coefficient

One difficulty in interpreting the data is that a higher sustainability coefficient is not necessarily an indication of good infrastructure management but could also occur in situations where there is a great need to bring the system up to date or where inefficient or expensive maintenance measures are employed. Nevertheless, this indicator has not been ignored here, as the condition of the infrastructure and the expenditure on its maintenance are important cost and service parameters of the water industry.

For Austria, the maintenance expenditure per metre of pipeline network was estimated using the average of the countries in the comparison. In the case of the renewal investment, one must take into account that for Austria no information on investment without grants is available and that the amounts stated are likely to be on the low side.

Overall, it can be observed that the water suppliers in Germany, with a sustainability coefficient of 2.0%, measured according to the value of fixed assets, have the highest expenditure, relatively speak-

ing, for renewal and maintenance, Poland (and Austria with reservations stated above) have the lowest (see graphic below).

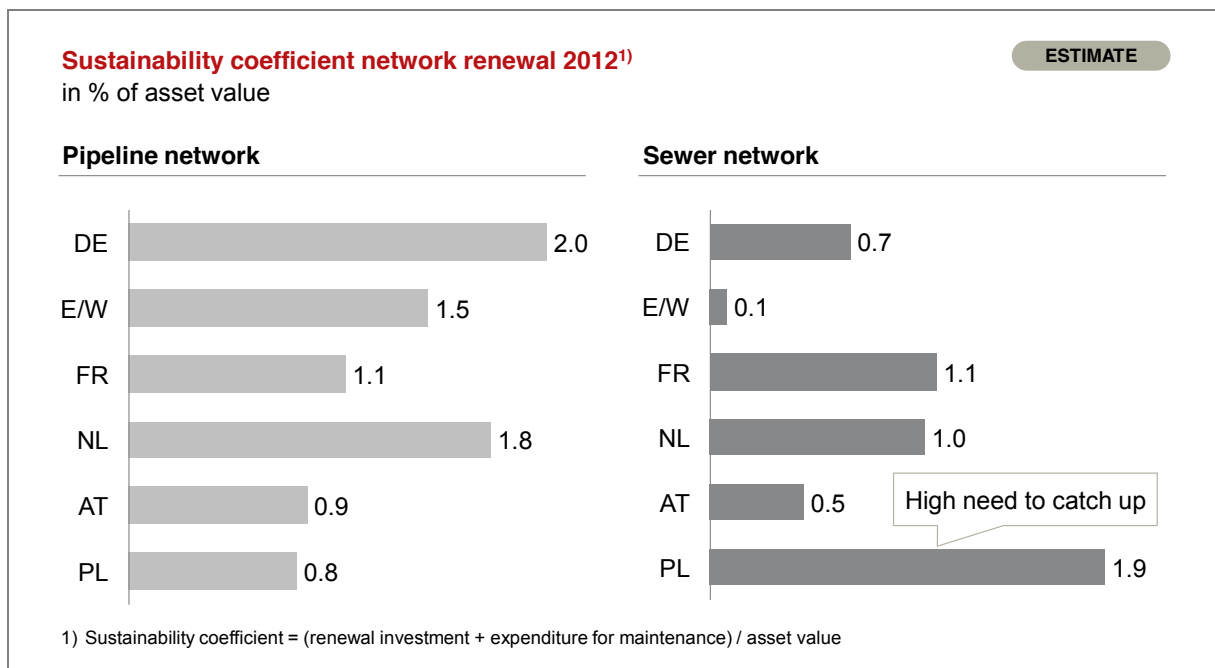


Fig. 45: Sustainability coefficient for network renewal 2012¹¹⁵

When looking at the sustainability coefficient of wastewater disposal, the need to update the sewer network in Poland becomes clear. The values for England/Wales and Austria are also noticeable (with the reservation stated above) as far as wastewater disposal is concerned.

¹¹⁵ Own calculation.

5. Prices, Taxes, Levies and Grants

5.1 Calculation of prices

In Germany, France, the Netherlands, Austria and Poland, prices in water supply and wastewater disposal are set at a municipal level for households and small businesses by the respective companies or by the municipalities themselves. In England/Wales there are regulatory and price setting systems which are organised at a central government level.

This study looks at prices in each case including sales tax. Basic prices and volume based prices are included in the average prices, construction cost contributions and one-off payments which are collected to finance investments are not.

In Germany, France, the Netherlands and Austria, construction cost contributions and one-off payments are collected; however, there is no comprehensive data collected on the amount of the construction cost contributions, hence these cannot be taken into account as a component of the price. In Poland, the existence of construction cost contributions could not be definitively ascertained. In England/Wales, this form of investment financing does not exist in practice.

Therefore, when interpreting the results, one must take into account that the average price in Germany, France, the Netherlands and Austria (and possibly in Poland) would be higher if construction cost contributions and payments were taken into account, whilst in England and Wales they would remain unchanged.

The situation in the individual countries is described below.

Germany

Charges and contributions are collected according to the municipal charges acts in Germany where the relationship between water supply or wastewater disposal company and its customer is based on public law obligations. All other companies collect payments under private law. Whilst the public law charges are monitored through the supervision of municipal authorities by the Länder, the private law fees charged by companies are monitored for misuse by the anti-trust authorities.

The calculation of prices and charges is based on the cost-recovery principle. The municipal charges act stipulates that charges must be calculated to ensure that no shortfall is created for the local authorities. Furthermore, the revenues of a local authority from charges and contributions may not exceed the total costs incurred plus a reasonable return on capital or they have to be balanced out in the following calculation period.

The average water price for households and small businesses in Germany is weighted according to volume of water supplied and usually comprises a monthly basic price and a volume dependent price but no one-off or periodic construction cost contribution. These are not included statistically in the calculation of the price.

There are two different methods of calculating wastewater charges in Germany. Either a uniform fee is charged according to the fresh water method; the costs for collection and treatment of rainwater are included proportionately in this uniform fee. Or, as is becoming increasingly common, a split method is

applied. In this case, the sewage charge is based on the volume of fresh water consumed whilst an additional rainwater charge is calculated on the basis of the size of the private plot being drained.¹¹⁶

In a DWA survey, no average wastewater price based on the fresh water and split methods for all households is calculated, as the unit for the fresh water method (€ per m³) and that for the split method (€ per m²) cannot be adjusted to a common denominator. The average price per m³ in 2013 was €2.11 according to the fresh water method, while it was €2.13 for wastewater and €0.85 for rainwater according to the split method¹¹⁷.

The average price across both methods, which is used for Germany as the basis for the price comparison, had to be calculated, for comparability purposes, on the basis of the household expenditure published by the German Federal Statistical Office, as a conversion to the calculation system of the DWA as well as changing the basic sample would not have allowed any meaningful comparison of the data. The expenditure for 2012 amounted to €249 per household per year¹¹⁸. Using the volume of water supplied one arrives at an average price of €2.80 per m³. This does not include one-off connection fees. These amount to approximately €15.00 per head per year.

England/Wales

In England/Wales also, the domestic tariffs for water and wastewater are set by the water supply and wastewater disposal companies. However, when doing so the companies must comply with the framework conditions set out by the regulatory authorities:

- Average price rises may not exceed the limits set by OFWAT for each company. The maximum price limits are applicable for a period of five years.
- The plans laid out by the companies within the set price limits and approved by OFWAT must be adhered to.
- Prices may not disadvantage individual water users.
- The total costs for provision of the services must be covered by prices.
- A balance must be achieved between bills for use measured with water meters and bills for un-metered use.

Household bills for water and wastewater are based on two different calculation methods.

The price for customers who have a water meter installed is based on the measured consumption. In addition to this variable component, there is also a fixed element to the price. Since 1 April 2000, all households have had the right to have a meter installed free of charge. Currently, 42% of households have a water meter.

The prices for the remaining households are calculated on the basis of a local, taxable asset value (so-called rateable value, RV), which formed the basis, until 1990, of the municipal property taxes in

¹¹⁶ BDEW (publisher), German Federal Statistical Office: Abwasserdaten Deutschland, 2014.

¹¹⁷ DWA Wirtschaftsdaten Abwasserbeseitigung 2014.

¹¹⁸ German Federal Statistical Office, water industry fees for disposal of wastewater from private households 2012.

Great Britain. In cases where the RV is not available or already out-of-date, companies can use a notional RV price, based on criteria such as size and location of the property. In addition to the price based on the RV, most companies use a fixed price.

For the costs incurred for connecting a property to the water supply and wastewater disposal system, companies can charge connection and infrastructure fees. However, this is not common in practice. The setting of these fees does not need to be approved by OFWAT.

The average price for level I for England and Wales calculated here is based on the published average household bill which takes into account both households with and households without water meters.

In order to make the prices in England/Wales comparable with those in European countries, where water meters are available in 100% of cases, the costs for the installation of water meters in the remaining 58% of households are added to the price at level III.

France

In France, unlike in Germany and England/Wales, the municipalities are responsible for setting prices. Where water supply and wastewater disposal have been delegated to private companies, prices are contractually agreed. Within that process a formula for price adjustments is agreed in addition to the basic price. In France, there is no regulation of prices at central government level but there is a body which controls abusive practices, which regularly checks prices in the water and wastewater industry.

All users of water (almost 29 million houses and apartments) in France have a water meter and are billed on a consumption basis. The only exceptions are in rural municipalities.

The removal of rainwater from public areas in France is a municipal responsibility. The costs incurred for this may not be transferred as a part of wastewater prices but must be borne from the tax revenues of the municipalities. In the case of sanitary systems, the municipalities bear the costs of the rainwater drainage system. In the case of combined sewers, the total costs are split according to a certain formula and the municipalities assume the part for public rainwater removal. Only the state motorway administration reimburses the municipalities for the costs of removal of rainwater from their land.

The costs of new connections are borne by the consumer. According to information in a study for the Ministry of Environment, in 2003 around €1.34 billion was earned for so-called billed services (water and wastewater). This accounted for 14% of the total revenues for water and wastewater.¹¹⁹

Netherlands

The water prices in the Netherlands are calculated and set by the ten responsible (publicly owned) companies for their respective supply areas. For this, each company uses a volume rate per cubic metre and a fixed basic charge per year. Formally, each property owner agrees to the proposed tariff. The basis for the price calculation are the costs incurred by each company, shown transparently in a benchmarking process every three years. Water prices in the Netherlands are strictly calculated ac-

¹¹⁹ Ernst & Young, Etude relative au calcul de la récupération des coûts, Section 4, 2004.

According to the cost-recovery principle. Almost all households possess a water meter so that the prices can be calculated on the basis of actual usage.

Differences in the national water prices arise due to several factors which ultimately result from the cost structure of the companies. VEWIN specifies in this respect in particular:

- the type of production: companies which use surface waters have higher costs for the treatment process than companies which use groundwater.
- water consumption: companies in areas where the citizens use a below average amount of water, have higher prices as depreciation and operating costs have to be distributed across a lower volume of water.
- the network complexity (defined as the number of connections per kilometre of network): operating costs increase with an increasing number of connections.

The cost-recovery principle designed in this way means that companies with unfavourable framework conditions demand higher prices from citizens. VEWIN calculates the national average water price on the basis of an average household (2.22 persons and approx. 44m³ consumption per head per year) and on the basis of the known total revenues divided by the volume of water supplied.¹²⁰

For wastewater disposal, citizens pay in two different ways. Firstly, the Dutch local authorities are responsible for the sewer networks. They cover their expenditure with a local tax (Rioolrecht). The revenues from this tax may only be used to cover expenditure on the collection and transport of wastewater (including rainwater). The local authorities have freedom to structure their own taxes and use different systems: mostly, a fixed amount per household is defined. It is possible, however, that the amount depends on the number of persons living in the household, on the water consumption or the value of the house in which the citizens live.¹²¹

Secondly, the regional water authorities (Waterschappen) are responsible for the treatment plants in which wastewater is treated. The Waterschappen are institutions at the level of the province government. They cover their costs for the treatment of water by collecting a water pollution levy; it is sometimes also described as a tax in the Netherlands, in Germany it would be described more as a charge). For private households, this is a fixed amount. One person households pay one third of the amount other households pay. Costs for monitoring the quality of surface waters are also covered by the water pollution levy. It should be noted that the wastewater prices are therefore not determined by a volume component (m³, drinking water method).¹²²

Beyond this, the Dutch pay a further charge to the regional water authorities (water authority charges, also described as an apportionment). This is due to the fact that the regional water authorities are not only responsible for the treatment of water in treatment plants and the quality of the surface water but they also regulate the water levels in ditches and smaller canals, maintain dykes in the scope of flood

¹²⁰ VEWIN (publisher), Water supply statistics 2012.

¹²¹ Information from COELO-Institute.

¹²² Information, COELO-Institute; Unie van Waterschappen (publisher), Water governance, the Dutch waterschap model, 2008.

protection and in some areas maintain part of the streets. The apportionment, with which the associated costs are covered, is not included in the calculation of the Dutch wastewater prices, however.

The average prices do not contain any construction cost contributions; a reliable level could not be ascertained.

Austria

In Austria, there is no uniform system for water and wastewater charges. Due to the federal structure and the fact that the right to charge fees rests with the local authorities, the tariff structure does not only vary between the different federal states but also between the local authorities within a state.

The key federal framework conditions are set out in the Fiscal Constitutional Law and the Fiscal Equalisation Law. When structuring the charges, four principles apply: the principles of equivalence, cost recovery, polluter pays and economic viability. The level of and basis for calculation of the connection fees and usage charges, minimum and basic charges (where applicable) as well as exemption provisions are set out in the schedules of fees of the local authorities.

Water charges generally comprise a connection fee and the water usage charge. For this purpose, the actual water usage is ascertained with the help of water meters. Depending on the system of charges in operation, the collection of one-off upgrade fees, extension fees and supplementary fees or rolling water meter fees and provision fees are possible.

The wastewater charges generally comprise sewer fees and sewer usage charges. The sewer fees usually relate to connection fees; in addition, upgrade fees, extension fees and supplementary fees are possible. The sewer usage charges can be calculated either according to water consumption or through a flat fee according to the average local wastewater production; alternatively, setting charges on the basis of the relevant area is possible. Furthermore, there can be a division in the provision and usage charges.

In 2002, around 89% of charges in water supply and 82% of charges in water disposal went on running charges, the rest on one time charges with 1% on third party charges.¹²³

The Austrian data is only available to a limited extent due to the complex fee structure in Austria. Statistik Austria previously published the charges for the towns/cities in Austria with over 10,000 residents on an annual basis. The annual costs of a "notional household" are reported (rented apartment with 80 m², 2 persons, 1 child, 1 WC, 1 bathroom and a water use of 150 m³ per year). Today the values are based on a study of the Austrian Association for Gas and Water (ÖVGW), which analyses 135 water companies.

Poland

In Poland, the (mostly public) companies are responsible for calculating prices. There is a broadly worded national directive which aims to provide the framework for the setting of tariffs. In practice, however, there is no uniform national standard; due to the strongly decentralised structure in Poland, a

¹²³ BMLFUW (publisher), Ökonomische Analyse der Wassernutzung für den Sektor Kommunale Wasserversorgung & Abwasserentsorgung bis 2004.

more precise overview is difficult. The usual case is a combination of a fixed amount and a consumption volume dependent amount. However, there are also purely volume dependent tariffs, which are widely used as well as purely fixed amounts, which are relatively rare.¹²⁴ The tariff proposals must be confirmed by the responsible local authority (gmina); they can demand amendments at their discretion. The measure for wastewater prices is usually the consumption of drinking water in m³. Around 94% of households are equipped with a water meter.¹²⁵

Historically, the prices in Poland were comparably low. For a long time they were politically determined and did not reflect the actual expenditure of the companies. The reason was primarily the low income of the citizens and the concern amongst the public institutions that the drinking water, as a basic staple of life, might no longer be affordable for the citizens – especially considering there were still considerable price increases.¹²⁶ Accordingly, the prices were subsidised by the municipalities. In those cases in which a full coverage of the costs incurred was targeted (especially where an external investor is involved) and the prices were significantly increased accordingly, there were strong protests; as a result, the water consumption fell as a reaction.

However, with the increases in basic income in Poland, the prices for water and wastewater have also increased sharply. The reasons for this are primarily the necessary financing of the investment still to come and the obligation of Poland to ensure a better recovery of costs in the medium term, in order to implement the European directives.

Each year the Chamber of Commerce "Polish Waterworks" (IGWP) calculates an average price for supply to households and industry as well as the disposal from households and industry. Whether and to what extent construction cost contributions are included could not be ascertained.

5.2 Taxes, levies and charges

An important factor which explains the differing levels of water and wastewater prices in the countries in the comparison is the extent to which water and wastewater prices are burdened with taxes, levies and charges. In the following, a comparison is made between the level of water and wastewater specific levies and charges as well as the value added taxes on water and wastewater.

The **water prices** in the countries in the comparison contain the following taxes, levies and charges¹²⁷.

The level of **value added tax** varies considerably between the countries in the comparison. In Germany, for all water suppliers, the (reduced) level of 7% value added tax is applied. Private households in England and Wales pay a value added tax of 0% on drinking water (thus enabling the water suppliers

¹²⁴ PriceWaterhouse Coopers (publisher), Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing (MEIF), commissioned by the European Commission, 2004.

¹²⁵ Information from IGWP 2010.

¹²⁶ From 2001 to 2007 the prices for water and wastewater rose on average by 37.5% (source: Kopanska, public-private partnerships in water supply and wastewater disposal in Poland, University of Warsaw 2009).

¹²⁷ Germany: BDEW expert conversation; IHK Pfalz: Die Wasserentnahmeentgelte der Länder, 2013; Institute for Infrastructure and Resource Management of the University of Leipzig, Trinkwasserpreise in Deutschland, 2008; England/Wales: OFWAT June Returns 2009, Table 21; OFWAT expert conversation 2009; France: Agences de l'eau; IFEN-Scees, Enquête Eau 2004; Netherlands: VEWIN (publisher), Water supply statistics 2007 and VEWIN (publisher), Reflections on performance 2006; Austria: expert conversation; Poland: WaterTime National Context Report – Poland, p. 23.

to be entitled to deduct input tax).¹²⁸ In France, the rate of value added tax on water supply is usually 5.5%. However, government operated enterprises in municipalities with under 3,000 residents can choose whether they waive the collection of value added tax or not. In the Netherlands, the rate of value added tax for all water suppliers is 6%, in Austria it is 10% and in Poland it is 7%.

Also in respect of the proportion of **water specific levies and charges** in the average water price, there are large differences between the countries.

In **Germany** the water prices are burdened with concession fees (levies for the right to supply water and to use the public street space) as well as water abstraction fees (taxes by the Länder for the use of water resources). The proportion accounted for by the concession fee is, roughly estimated, on average 10% of the average water price. The exact proportion cannot be determined. The rates depend on the number of residents in the relevant municipalities and can be up to 18% of the respective fees. In municipalities with under 3,000 residents, no concession fees are collected. Water abstraction fees are collected in ten German Länder. On average across Germany, the Länder imposed taxes and levies on water prices at a level of 4.4% in 2012. The amounts collected through water abstraction fees are put to various uses dependent on the respective Land. In some Länder (e.g. Hamburg and Berlin), there is no statutory earmark on the use of the tax revenues. The total annual revenues of the Länder from the water abstraction fee were between €200 and 390 million from 2000 to 2012.

The water industry in **England and Wales** is subject to 10.2% taxes, levies and charges. In addition to levies to the Environment Agency (3.1%) local authority rates (7.1%) are also due. These comprise several components including a water abstraction charge, the revenues from which are used for the protection of resources.

In **France** levies are collected as an itemised entry in the water and wastewater bills. Until 2005, in the area of water supply, in addition to the levy for "préservation", a levy existed for the FND AE (Fonds national de développement des adductions d'eau) (at that time 1.4%) as a water abstraction charge. The revenue collected from the FND AE served to support water-related projects in rural areas and thus redress structural and regional differences. The pay out of grants and reduced-interest loans were coupled to compliance with environmental standards. Since 2005, however, the FND AE is no longer collected. The levy for "Préservation" in 2006 was 2.0%.

In the **Netherlands**, several levies and taxes are imposed. The groundwater tax which was paid by supply companies has been abolished. In 2007, it was still at 13.1 cents. Companies do pay levies, however, for groundwater use to the provinces. These vary from province to province and are on average 1.1 cent per m³. Furthermore, concession charges have to be paid in some municipalities for the use of public property (on average 1.1 cent per m³). In addition, citizens have to pay a further tax to the state for the use of water (whereby the water companies first collect this tax). The Dutch Environmental Tax Act has introduced a so-called tap-water tax since 2000, which has to be paid by households and industrial customers. This tax is only imposed on the first 300m³ per year supplied – as the water consumption of a household is usually below this threshold, the tax applies to the whole amount. Approximately 11.8 cent per m³ is attributable to this tax. 6% value added tax is also imposed on that tap water tax.

¹²⁸ Industrial customers in England/Wales pay 17.5% value added tax.

In **Austria**, there are concession fees but no abstraction charges. There is no information on the amount of the concession fees.

In **Poland** there are, in particular, charges for the extraction of water from natural sources. They differ depending on the region, the type and the quality of the abstracted water. They are higher if the abstractor has not obtained a permit, which must be done beforehand.¹²⁹ No information is known on the average level of these levies.

In summary, one arrives at the following estimates for the proportion of taxes, levies and charges in the area of water supply¹³⁰: The burden on taxpayers in Germany is around 21.4%, in England/Wales 10.2%, in France around 7.5% and in the Netherlands, after the abolition of the groundwater tax, 8.5%. No figures could be produced for Austria and Poland.

The **wastewater prices** are also subject to taxes, levies and charges.¹³¹

The **value added tax** is also at varying levels in respect to wastewater. Whilst publicly owned companies are not subject to tax in Germany, around 17% of private companies¹³² are subject to the full rate of value added tax, currently at 19%. In average across all companies, there is therefore a burden from value added tax of 3.2% in Germany. Presumably, a volume based analysis would lead to a higher proportion for private companies and therefore also a higher average value added tax burden. In England and Wales, households do not pay value added tax on wastewater either. In France, government operated enterprises in municipalities (irrespective of their size) can choose whether they collect 5.5% or 0% value added tax. In Austria, the level of value added tax for public enterprises and private companies is 10%, in the Netherlands it is 6% for both and in Poland 7% for both.

The levies specific to wastewater in the countries in the comparison are as follows:

In **Germany**, wastewater disposal companies pay, depending on the Land, different wastewater levies. Currently on average the rate is 2.0% of the wastewater price (€0.05 per m³). The revenue from the wastewater levy was on average €300 million per annum between 2005 and 2007.

In **England and Wales** the levies (known as "service charges") in the amount of 1.6% which companies pay to the Environment Agency, include fees for the discharge of wastewater. The revenue is used for water protection measures. In addition, 4.2% local authority rates are due.

In **France** the river basin agencies (Agences de l'eau) finance water protection measures from the revenue from the "pollution" levy as well as investments in the area of wastewater disposal. One criticism is that households indirectly support agriculture. As such, 84% of the levy for "pollution" is col-

¹²⁹ Koc, Economic and social aspects of the development of waste water charges in Poland, Ministry of Environment, Warsaw, 2001.

¹³⁰ The percentage rates relate to the total revenue from water prices. If not all companies or consumers are subject to the respective tax or charge, the relevant proportion is estimated.

¹³¹ Germany: German Federal Environment Ministry, Aufkommen der Abwasserabgaben 2004-2007; DWA Wirtschaftsdaten Abwasserbeseitigung 2014; England/Wales: OFWAT June Returns 2009, Table 22; expert conversation; France: Ministry of Environment / IFEN-Scees, Enquête Eau 2004, expert conversation; Netherlands: Rioned (publisher), Urban drainage statistics, 2009-2010; Handbook Biological Wastewater Treatment, website, Wastewaterhandbook.com; expert conversation, COELO-Institute; Austria: expert conversation; Poland: WaterTime National Context Report – Poland, p. 23.

¹³² DWA: Economic data 2014; weighting according to number of registered residents

lected from households although it is assumed that households only contribute one third to the pollution of the waters.¹³³ Overall, the "pollution" levy fell from 26% to 15% between 2001 and 2006.

In the **Netherlands** wastewater disposal is financed solely through levies and charges, see the section on "Calculation of prices". As the operators of the sewer networks and the treatment plants are public utilities and not companies, no further levies apply. One interesting aspect is that those industrial companies (and in some cases also households in remote areas) which discharge sewage directly and untreated into surface waters have to obtain a license and pay an environment tax ("penalty tax") for it.¹³⁴

In **Austria** no wastewater levies are collected.

In **Poland**, in addition to value added tax, levies are imposed in particular for the discharge of wastewater into the environment. This is designed so as to implement the polluter pays principle. The levies differ depending on the region, volume of wastewater, substances contained and the place of discharge (ground, type of water). They are higher if no permit, which has to be obtained beforehand, is presented by the polluter. Together with various penalties for "abuse of natural resources" (illegal water abstraction, discharge of larger volumes of wastewater than permitted, pollution of lakes and coasts, illegal disposal of waste by individuals or companies etc.), these levies flow into an environment fund which, in turn, feeds various funds for environmental protection and water management on a national level, as well as on the level of the Wojewodschafte (provinces), the Powiats (counties) and Gminas (municipalities). Money from these environment funds can be used to finance measures which contribute to the preservation of resources and the protection of the environment in general; it is also used, however, to co-finance investment in municipalities with fewer than 2,000 residents or (from the national fund) the construction of large wastewater treatment plants.¹³⁵ Due to the multi-faceted nature of levies and penalties and the variety of uses for the money collected, no overall total for the revenues involved can be calculated.

In summary, one arrives at the following estimates for the proportion of taxes (including value added tax), levies and charges in the area of wastewater disposal: The burden on taxpayers in Germany is at least 5.2%, in England/Wales it is around 5.8%, in France around 20% and in Austria 10%. No information in relation to Poland could be found. Comparable statements on the Netherlands could not be made because in this country wastewater disposal is entirely financed through levies and charges.

5.3 Financing and grants

5.3.1 Financing with own and third party capital

In **Germany** BDEW collected data until 1997 on financing in the area of water supply. According to that data, 58% of the investment in the area of water supply was internally financed and 36% external-

¹³³ PriceWaterhouse Coopers, Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing, (MEIF), commissioned by the European Commission, 2004, WP 5, p. 9.

¹³⁴ European Environment Agency (EEA), Effectiveness of urban wastewater treatment policies in selected countries, EEA Report No 2/2005.

¹³⁵ Koc, Economic and social aspects of the development of waste water charges in Poland, Ministry of Environment, Warsaw, 2001.

ly financed (for 7% there was no information available). A detailed itemisation of the sources of funding only exists up to 1994.¹³⁶ No data is available for wastewater.

In **England/Wales** the water supply and wastewater disposal systems are financed, in addition to the above revenues, solely from own and borrowed capital. The model established with the privatisation of the water industry of financing to a large extent without grants is unique in Europe. However, the traditionally high proportion of own capital has fallen in recent years. Whilst the proportion of borrowed capital compared to own capital was 41% at the time of privatisation in 1998/99, it was at 57% in 2002/03 and at 66% in 2007/2008.¹³⁷ Critics of this development fear that the increase in borrowed finance could have a detrimental effect on the quality and efficiency of the water supply and wastewater disposal systems. This has led to a discussion on the treatment of risks and incentives of management for efficiency and quality improvements.

Precise information on the proportions of borrowed finance and own finance in the water and wastewater industry in **France** is lacking. According to a study, the proportion of credit financing of water supply and wastewater disposal companies was 17% in 2003.¹³⁸ This number includes the borrowing of river basin agencies which, for their part, finance themselves through water revenues. Whether investments are financed by borrowing or reserves can be decided at the discretion of the municipalities. Whilst some municipalities take loans at the time of the investments, other municipalities plan future investment and accumulate reserves accordingly. These differing financing strategies have effects on the water and wastewater prices.¹³⁹

In the **Netherlands** a balance sheet of sorts is produced which shows that over recent years 28% of the total investment was funded by own capital, 65% by loans and 8% from other sources.¹⁴⁰ No data is available for the area of wastewater.

In **Austria** 42% of investments in the area of water supply in the period 1993 – 2002 were financed from borrowed capital, 31% from subsidies (19% federal, 12% state), 20% from own capital and 7% from connection charges. The sources of financing for municipal wastewater disposal projects comprised 33% borrowed capital, 47% subsidies (36% federal and 11% state), 8% from own capital and 12% from connection charges.¹⁴¹

In **Poland**, the respective values can only be roughly estimated due to the decentralised competences and the generally complicated financing set up. In the area of water, around 49% of funds come from the own finances of the municipalities, 46% from various forms of borrowed capital (including grants)

¹³⁶ BGW Wasserstatistik 1997.

¹³⁷ OFWAT, Financial Performance and Expenditure report 2003-04 and 2007-08; PriceWaterhouse Coopers, Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing, (MEIF), commissioned by the European Commission, 2004, WPS, p. 27.

¹³⁸ PriceWaterhouse Coopers, Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing, (MEIF). Commissioned by European Commission, 2004, J. Faby, Presentation of MEIF results for France, p. 3.

¹³⁹ PriceWaterhouse Coopers, Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing, (MEIF). Commissioned by European Commission, 2004, WP 6, p. 26.

¹⁴⁰ VEWIN (publisher), Water supply statistics 2012.

¹⁴¹ BMLFUW (publisher), Ökonomische Analyse der Wassernutzung für den Sektor Kommunale Wasserversorgung & Abwasserentsorgung bis 2004.

whilst 5% fall into the category of "other". In the wastewater sector, around 39% of funds come from the municipalities and 57% from external sources (including grants) with 4% "other".¹⁴²

5.3.2 Grants

In all of the countries in the comparison, grant or subsidies are given to companies in the water and wastewater industries, however the manner differs. The grants or subsidies are afforded a special significance in the price comparison at hand, as they are used as a basis for the price model in order to calculate the prices necessary to achieve cost recovery.

The following chapter lays out the aid granted in the area of drinking water and wastewater over recent years. It can be seen that according to the absolute figures, on average the highest levels of aid are granted in France and Poland and the lowest in the Netherlands. In England/Wales, the water industry currently receives only a marginal amount of aid, however massive subsidies were granted in the scope of privatisation in 1989. Therefore, for the purpose of establishing comparability with the other countries, this subsidy is notionally treated as a state grant over a period of 30 years.

In all of the countries in the comparison, the aid in the wastewater sector is much higher than that for the drinking water sector. Following this, detailed information on the individual countries is presented.

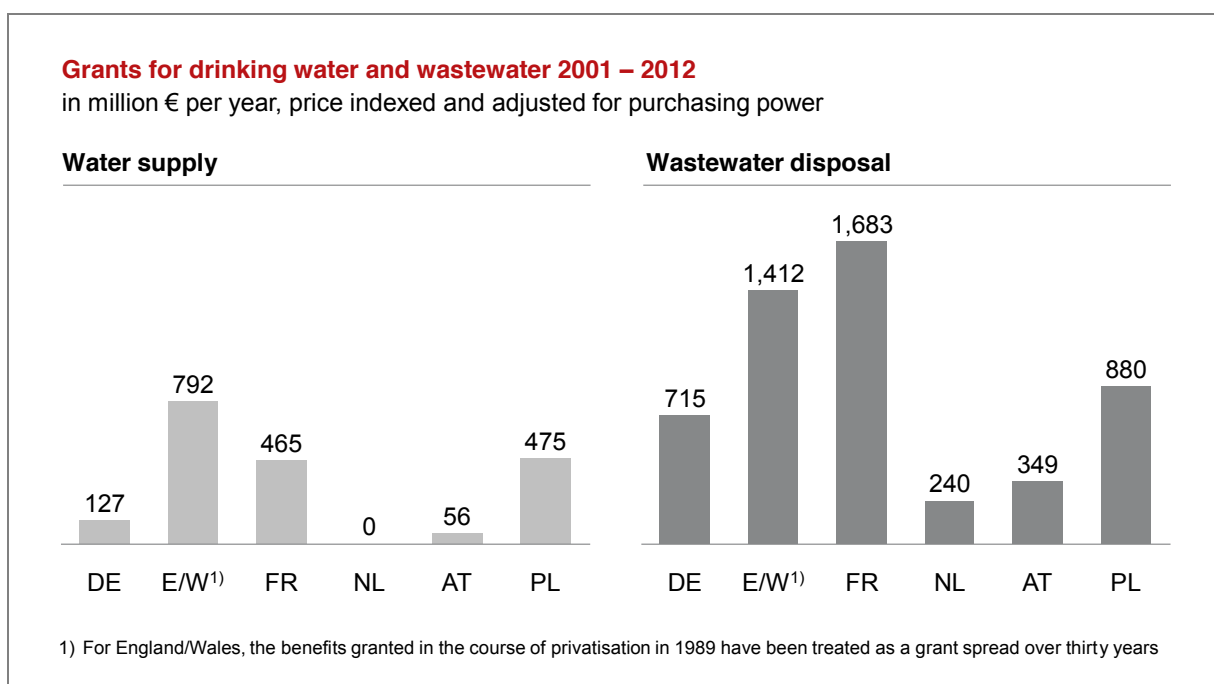


Fig. 46: Aid for drinking water and wastewater 2001 – 2012¹⁴³

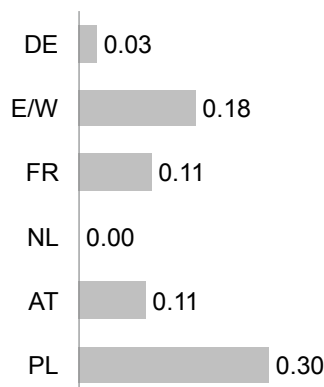
¹⁴² GUS (publisher), local data base, expert conversations, own calculations.

¹⁴³ For sources see the description of the individual countries on the following pages.

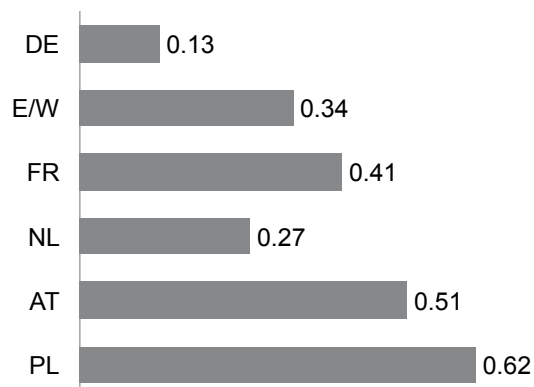
Specific grants for drinking water and wastewater 2001 – 2012¹⁾

in € per m³ of water supplied per year, price indexed and adjusted for purchasing power

Water supply



Wastewater disposal



1) Available data for grants was used to calculate the averages (see following figures)

Fig. 47: Specific aid for drinking water and wastewater 2001 – 2012¹⁴⁴

In **Germany** the aid is funded by the federal Länder, the federal government and the EU. In some Länder, there are water industry projects financed by the municipal fiscal equalisation system (KFA). A further source of financing is the joint task "Improvement of agrarian structures and coastal protection" (GAK), with which companies within the water industry are supported in regions whose economic strength is considerably below the average for Germany. These funds comprise 40% state funds and 60% federal funds. The most important European fund for Germany, as far as the water industry is concerned, is the Regional Development Fund (ERDF) which was set up to reduce regional imbalances in Europe. Another way in which aid is provided in Germany is that companies are granted low-interest loans. Between 1990 and 1994, low interest loans accounted for on average 27% of the total aid for the water supply and 24% of the total aid for wastewater disposal.¹⁴⁵ Current data on this is not available.

Data on the level of aid could not be found. Until 2001, central statistics were kept on aid; since then data has no longer been collected on a nationwide basis. In the scope of this study, a collection of data on aid by the German Länder was undertaken. Whether the respective information collected is complete cannot be verified (see also Section 2.1).

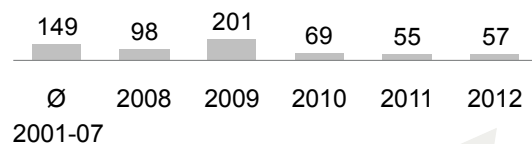
¹⁴⁴ For sources see the description of the individual countries on the following pages.

¹⁴⁵ Annual reports of the water industry (joint reports of the federal ministries which deal with the water industry), 1990-1994 and own calculation.

Grants, Germany 2001 – 2012

in million € per year, price indexed and adjusted for purchasing power

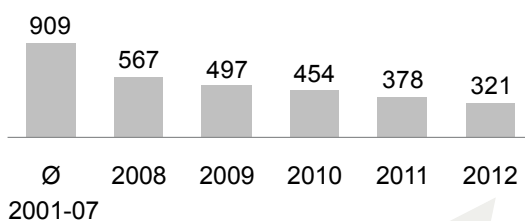
Water supply



% of investment

2

Wastewater disposal



% of investment

8

Fig. 48: Aid, Germany 2001 – 2012¹⁴⁶

In Germany, the level of aid has fallen considerably in recent years. Whilst the aid granted in the area of water supply was on average €300m per year in the 1990s, the average level was just €127m between 2001 and 2012. In the case of wastewater disposal, the average grant (without grants from the water levy) was €2.0bn per year in the 1990s (price indexed) and €715m per year on average in the period 2001 – 2012.¹⁴⁷

In **England/Wales** the water industry in principle not subsidised, aside from the marginal grants from the EU. The EU grants are very small. In 2007, they amounted to £0.2m for the water supply and £0.8m for wastewater disposal.¹⁴⁸

However, the conditions under which the water industry was privatised in 1989 must be regarded as a state grant. The companies were granted debt relief and transfer payments in the amount of £6.4bn (at 1989 prices). The idea of this so-called green dowry was to put the companies in a position to undertake substantial investments in order to achieve the statutory quality standards in the long term. In order to take these benefits into account when comparing the prices of water and wastewater, both are treated as grants payable over a period of 30 years. This method is in accordance with the approach of the IFIP, developed in collaboration with OFWAT.¹⁴⁹ In addition to the green dowry, the

¹⁴⁶ Data collection from the German Länder, 2014.

¹⁴⁷ Annual reports of the water industry and collection of data from the relevant Land ministries.

¹⁴⁸ OFWAT, Value of grants received by the E&W water sector for 2007-08 (unpublished).

¹⁴⁹ The following assumptions apply: the companies receive the *green dowry* like a loan with an annual rate of repayment over a period of 30 years. The annuity calculation is based on 2001 prices, the real interest rate is set at 4%. The sum is divided between water and wastewater according to the value of the existing infrastructure. Following the approach of IFIP in collaboration with OFWAT. C.f. Austrian Conference of Cities and Federal Chamber of Labour, Internationaler Vergleich der Siedlungswasserwirtschaft, Vienna 2003, pp. 206 et seq.

companies received tax relief to the value of £7.7bn¹⁵⁰ (at 1989 prices) with the objective of enabling an accumulation of capital. These funds are also treated as grants in this study and presented after price indexing. In the area of water supply, this amounts to average annual grants of around €792m for the years 2001 – 2012 and of around €1,412m for wastewater disposal.

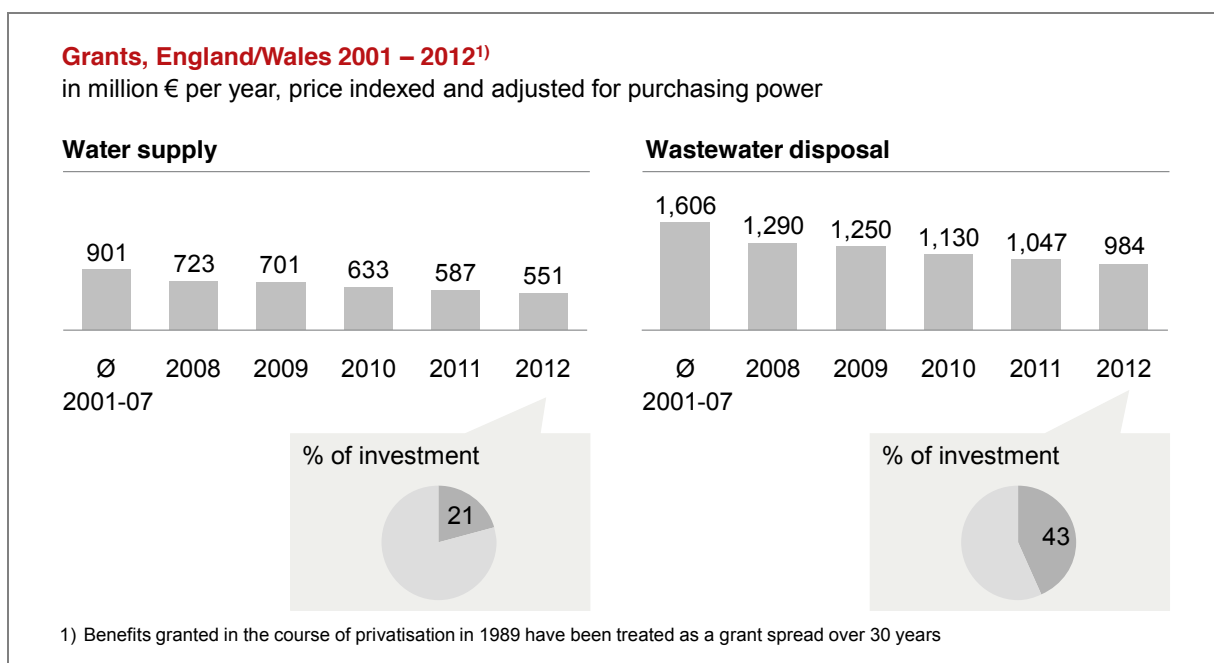


Fig. 49: Grants, England/Wales 2001 – 2012¹⁵¹

In **France**, grants are issued for investments, which are mainly financed from the municipal tax revenues. The funds of the river basin agencies and the FNDAB cannot be fully attributed to the grants as they are financed from charges which are collected in customers' water and wastewater bills. Further providers of grants include the municipalities, the Départements and the regions. Rural localities in France receive funds from the general budget of the Ministry for Agriculture. Municipalities with under 3,000 residents (90% of French municipalities) can finance investment in the area of water supply and wastewater disposal directly from the public budget.

The Ministry of Environment states in its statistics for the year 2011 that grants for water amounted to €419m and for wastewater €1,656m. In this context, the grants have risen almost constantly since 1990.¹⁵²

¹⁵⁰ OFWAT, Financial Performance 1998/1999, quoted in: Austrian Conference of Cities and Local Authorities and Federal Chamber of Labour, Internationaler Vergleich der Siedlungswasserwirtschaft, Vienna 2003, p. 210.

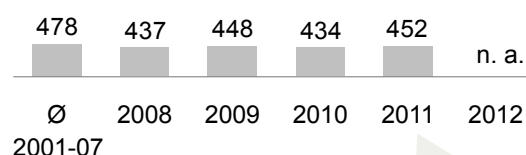
¹⁵¹ OFWAT expert conversation 2009 and subsequent calculations.

¹⁵² Ministry of Environment, Les Comptes Économiques de l'Environnement en 2005 and 2007; expert conversation.

Grants, France 2001 – 2012

in million € per year, price indexed and adjusted for purchasing power

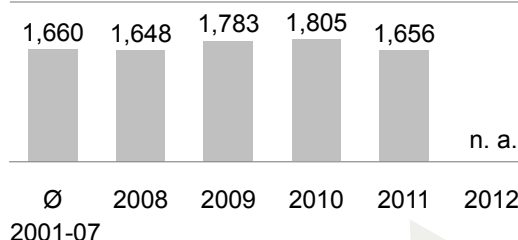
Water supply



% of investment

19

Wastewater disposal



% of investment

41

Fig. 50: Grant, France 2001 – 2012¹⁵³

For the years 2001 to 2012, this corresponds to an average figure of €460m for the water sector and €1,668m for wastewater.

One can see a similar level by looking at the gap between revenues and costs (without depreciation for wear and tear) plus investments shown in a 2004 study for the French Ministry of Environment. Thus, only 80 – 85% of operating and capital costs are covered by revenues and 15 – 20% by grants.¹⁵⁴

In the **Netherlands**, according to the national statistics office, CBS, there have been no payments of grants since 2003; all costs of the companies – including any investments – are covered by the charges paid. In the area of wastewater, CBS publishes grants paid to the regional water authorities (for wastewater treatment) or to the municipal authorities (for the sewer networks), however recently only every two years¹⁵⁵. The grants come largely from the Dutch central government. The regional water authorities only received EU funds to a very limited extent (€1m in 2007).¹⁵⁶ Of the grants paid in 2011, a good 20% went to the regional water authorities and almost 80% to selected municipal authorities. In total, the grants in the wastewater sector in the Netherlands from 2001 to 2012 amounted to on average €240m per year.

¹⁵³ Commissariat général au développement durable; expert conversation.

¹⁵⁴ Ministry of Environment, Les Comptes Économiques de l'Environnement en 2005 and 2007; expert conversation.

¹⁵⁵ CBS Statline: Kosten en financiering van het milieubeheer.

¹⁵⁶ Information, Unie van Waterschappen.

Grants, Netherlands 2001 – 2012

in million € per year, price indexed and adjusted for purchasing power

Water supply

1	0	0	0	0	0
Ø	2008	2009	2010	2011	2012
2001-07					

% of investment

0

Wastewater disposal

260	209	206	201	197	n. a.
Ø	2008	2009	2010	2011	2012
2001-07					

% of investment

16

Fig. 51: Grants, Netherlands 2001 – 2012¹⁵⁷

In **Austria** public grants come from EU, federal and state funds. The largest part comes from the federal government. The statutory basis for the grants is in the Austrian Environmental Aid Act (UFG) of 1993. The administration is handled by the Kommunalkredit Public Consulting GmbH, a subsidiary of Kommunalkredit Austria. The payment of the grants is usually divided over 25 years (with differing levels of instalments). For smaller investments, a grant is paid in two instalments. In the scope of this study, the grants are presented in the order of their pay-out dates.

Between 1994 and 1999, 29 projects were co-financed from EU funds (ERDF and INTERREG). The aid amounted to around €15.3m. For the period 2000 – 2006, there was a maximum of around €23.1m available and for the period 2007 – 2013, €31.7m¹⁵⁸. The amount of payments actually made is not known. In the scope of this study, the maximum available EU funds are divided equally over the 7 years.

The grants of the individual federal states are only paid out if eligibility for aid exists under the Austrian Environmental Aid Act, and they differ widely in their amount and structure (including investment grants and loans). In the area of water supply, grants are between 0 – 40% and in the area of wastewater disposal between 0 – 54%. Vienna is the only federal state which does not provide any grants. Precise information on the total amount is not available. In the scope of this study, therefore, grants from the federal states were roughly estimated in relation to the federal government grants.

In total, therefore, one arrives at a figure for Austria for the period 2001 – 2012 of €56m of grants on average per year for water supply and of €349m of grants for wastewater disposal.¹⁵⁹

¹⁵⁷ CBS Statline (publisher), Kosten en financiering van het milieubeheer, expert conversation Unie van Waterschappen.

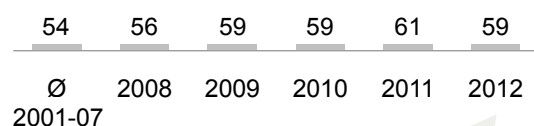
¹⁵⁸ BMLFUW (publisher), Umweltförderungen des Bundes 2007

¹⁵⁹ BMLFUW (publisher), Ökonomische Analyse der Wassernutzung für den Sektor Kommunale Wasserversorgung & Abwasserentsorgung bis 2004.

Grants, Austria 2001 – 2012

in million € per year, price indexed and adjusted for purchasing power

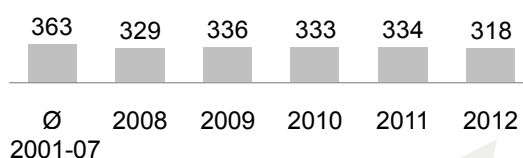
Water supply



% of investment



Wastewater disposal



% of investment



1) Proportion of grants in Austria tends to be stated higher than it actually is, as volume of investment is not wholly known

Fig. 52: Grants, France 2001 – 2012¹⁶⁰

It could not be ascertained with certainty whether the operation of the water supply and wastewater disposal also receives support from municipal budgets. According to a study in which the budgets of around 2,300 municipalities were analysed, the majority of the municipalities did not achieve cost recovery; the study found that on average only 50% of the total costs of the water supply were covered by the respective charges (although it should be noted that the total included investments).¹⁶¹ Experts attribute the fact that prices are too low to socio-political reasons. Unfortunately, no data was published on that study.

The water industry in **Poland** receives grants in many different ways and at significant levels. A key reason for this is the huge investment effort made by the country, after a long time operating under a planned economy, to meet the European requirements following accession to the European Union in 2004. In addition to grants from the local authorities, the Woiwodschaften and the Polish state, it is primarily EU funds which form an important pillar of the financing of necessary infrastructure in the area of water supply and wastewater disposal.

Up to 2004, Poland already received grants as an EU accession candidate, primarily from the ISPA (Instrument for Structural Policies for Pre-Accession), from the PHARE program (for environmental protection) and the SAPARD program (for rural and agricultural development). From 2000 to 2002, for example, the EU released almost €850m for infrastructure projects from the ISPA programme. After accession to the EU, these funds were replaced by grants from the European Structural and Cohesion Funds and the European Regional Development Fund (ERDF). For the national programme, "Infrastructure and Environment for the years 2007 to 2013", Poland is expecting total EU grants in the amount of €28bn, of which 18% will go to the area of the water industry/environmental protection, thus a good €5bn, of which the largest part will go into transportation infrastructure projects. The largest

¹⁶⁰ Expert conversation Kommunalkredit Public Consulting

¹⁶¹ Klein, Kostal, Europäische Analyse kommunaler Wassergebührenpolitik, p. 6

single project in water management is the construction of the Warsaw treatment plant, in two stages, which alone received €575m in grants.¹⁶²

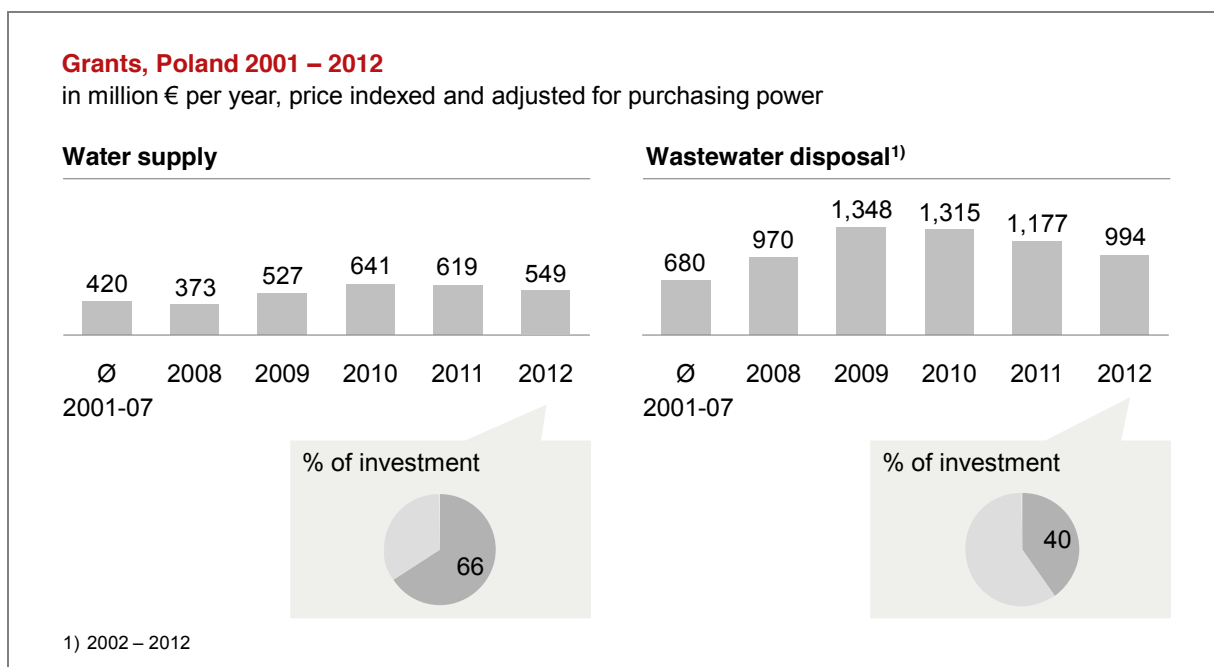


Fig. 53: Grants, Poland 2001 – 2012¹⁶³

Without the aid from European funds, Poland would not have been in a position to meet the EU requirements stipulated in the various Directives (see Section 7). Some infrastructure measures receive 80% of their funding from EU grants. The National Fund for Environmental Protection and Water Management (Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej) receives the European (and sometimes also national) aid and passes it on to investors, earmarked for particular projects. The modalities of the programme application process, as well as the approval, phased financing and monitoring of projects, which are always co-financed from national sources, ensure on the one hand that a high level of acceptance is promoted and a misuse of funds is prevented. On the other hand, however, the processes are described as being very protracted prior to a measure being commenced.

A factor peculiar to Poland is that (repayable) credit and loans, which are initially granted for infrastructure projects, can subsequently be converted, upon successful completion of a measure, to (non-repayable) subsidies. This partial waiver of repayment of loans was also treated as a subsidy in the scope of this study. Finally, credit afforded by Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej is granted to investors at very favourable terms. The difference between those favourable loans and loans at market rates (difference in interest rate) was included in the calculation of grants.¹⁶⁴

¹⁶² Robin de la Motte, PSIRU, Business School, University of Greenwich: D10i WaterTime National Context Report – Poland, January 2005; Aktualizacja Krajowego programu oczyszczania ścieków komunalnych (AKPOSK) 2009, Warsaw, February 2010; The National Fund for Environmental Protection and Water Management (publisher), Scope of activities of the National Fund, 2010.

¹⁶³ Ochrona środowiska 2005-2014, GUS (publisher) local data base, expert conversations; own calculations.

¹⁶⁴ Expert conversation with National Water Management Authority.

For 2001 to 2012, it has been ascertained that, on average, grants in the amount of €475m per year were paid in the area of water and €880m in the area of wastewater (after adjustment of the price level on the basis of purchasing power parity).

An analysis of the grants per m³ of water supplied or sewage volume in relation to the average investment per m³ produces the following graphic for water supply and wastewater disposal in comparison. Where data is available from previous VEWA studies, these have also been included in the corresponding time series.

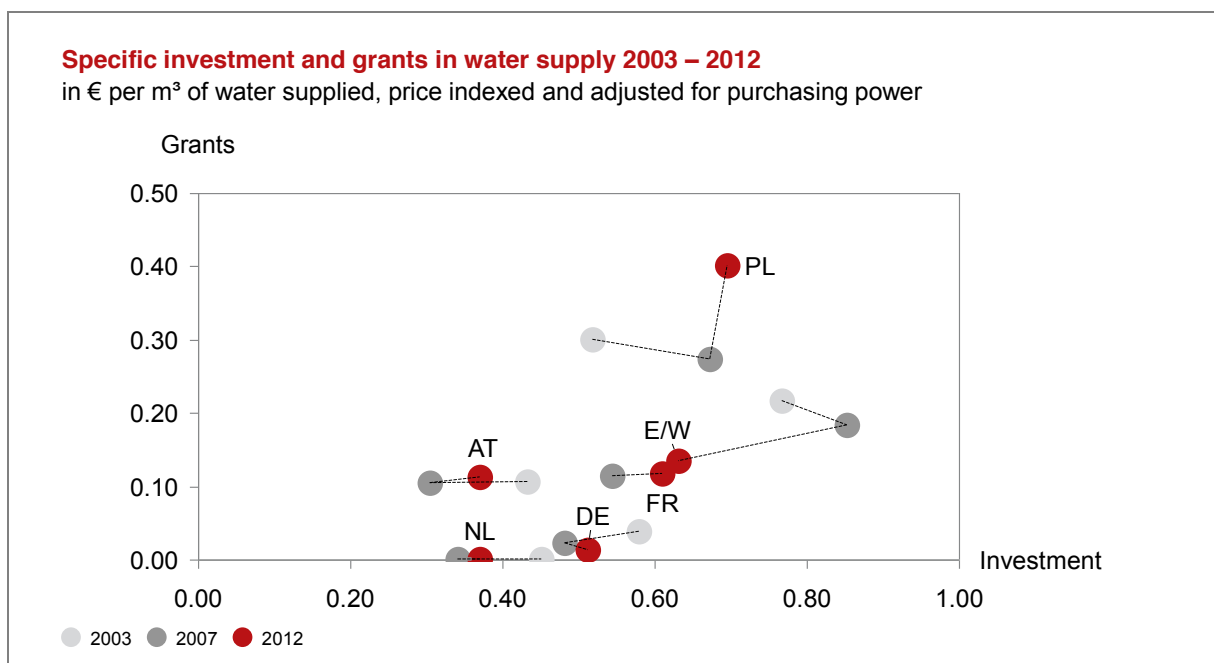


Fig. 54: Specific investment and grants in water supply 2003 – 2012

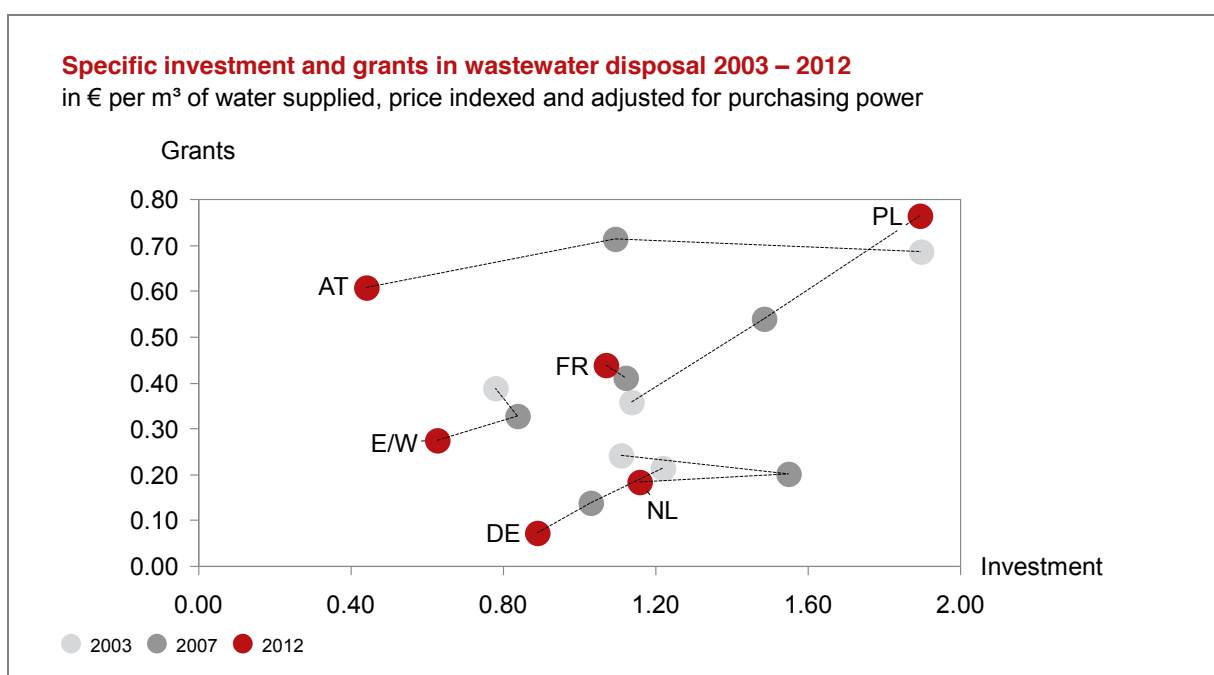


Fig. 55: Specific investment and grants in wastewater disposal 2003 – 2012

In comparison, the German and Dutch companies within the water and wastewater industries receive the lowest level of grants by some distance and as such they come closest to meeting the demands under the WFD for cost recovery pricing¹⁶⁵. This also applies to England/Wales, if one disregards the special case of the one-time transfer payment in the scope of privatisation in 1989. Whilst Poland still enjoys special framework conditions, due to their later accession to the EU, the grant payments in France and Austria up until now are hardly compatible with the objectives of the WFD.

¹⁶⁵ See also Section 6 in this context.

6. Comparison of Water and Wastewater Prices

Firstly, in a methodological part, the three level analysis model for the comparison of water and wastewater prices will be presented. From that, prices, services and costs of water supply and wastewater disposal will be quantitatively compared.

6.1 Analysis model

The comparison of prices and services in the water and wastewater industry in the countries is based on a three level analysis model which is explained below. Any mention simply of prices in the following refers to the respective water and wastewater prices (or wastewater charges).

At **level I**, the country specific average prices, published in the countries in the comparison, of the water suppliers and wastewater disposal entities, currently paid by connected households, are compared. The prices are presented from a consumer perspective and therefore including sales tax. The figures produced at this level answer the question, "What does the consumer pay directly for his or her water and wastewater?"

The average prices were calculated by weighting the different individual prices of the companies and the public institutions within a country. Possible factors which can form the basis of the weighting process are the volume of water supplied by the companies or the number of residents supplied by the respective company. In Germany (water) and in England, the country specific average prices are weighted by volume, in Germany (wastewater), France and Austria by number of residents. In the Netherlands, the known total revenues were divided by the total volume supplied. In Poland, until now median values from hundreds of individual prices are presented without weighting. The average prices contain fixed basic prices and variable operation and volume based prices. One time or periodic construction cost contributions and contributions borne by households are not included. For Germany, the wastewater price is calculated on the basis of the freshwater method and the split method.

At **level II** all grants or subsidies from public institutions (EU, state, Länder, municipalities etc.) are integrated into the price model in order to calculate the cost covering water and wastewater prices.¹⁶⁶ In addition to revenues from prices, the grants are therefore also included in the calculation, specifically in the year in which they are paid. For England and Wales, the benefits afforded at privatisation are treated as grants over a period of 30 years.¹⁶⁷ Level II thus considers the question, "What do water and wastewater cost when grants are taken into account?"

Level III compares the prices under the assumption of a uniform standard of service in the countries. It addresses the question of how high prices in the countries in the comparison would be if all countries had the same level of service.

The challenge in level III is to find a basis for the comparison in quantitative data

- which reflects the quality and service level in the respective country,

¹⁶⁶ The definition of cost recovery here should not be confused with the cost recovery required in the EU Water Framework Directive (EU-WFD 2000/60EC).

¹⁶⁷ See section 5.3.2

- which can actually be calculated into the water and/or wastewater price and
- which is reliably available or can be estimated for all of the countries under examination.

At level III, the question to be dealt with is therefore "What would water and wastewater cost in the countries in the comparison, if there were a uniform level of service?"

The three levels are summarised in the following diagram.

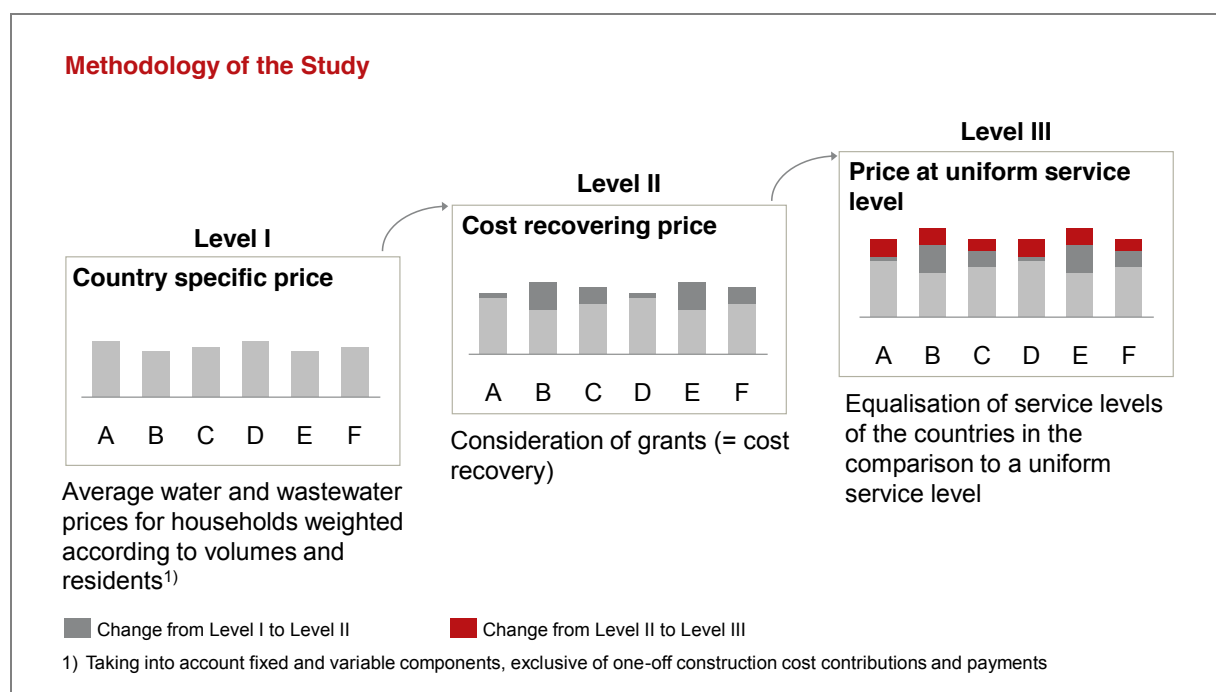


Fig. 56: Methodology of the study

In conclusion, two graphics will be presented for each of the three levels:

- water and wastewater prices per m³
- expenditure per head per year for water and wastewater (on the basis of the average usage per head per day).

For the sake of perspective, expenditure per head per year for water and wastewater will also be explained as a proportion of disposable income.

6.2 Water price comparison

6.2.1 Level I – country specific water price

The first level presents the country specific water price of water suppliers including sales tax which is currently paid by households. The average water price contains basic and volume based charges but

no one-off construction cost contribution¹⁶⁸. The calculation of prices has already been addressed in Section 5.1 above.

In terms of the comparison on level I, one must take into account that the difference between the prices in the countries in the comparison is due, amongst other things, to the very different levels of water consumption in those countries. A low consumption of water reduces on the one side the expenditure of the individual consumer. On the other side, lower consumption increases the water price per m³, as the fixed costs of the infrastructure are then spread over a lower volume of water supplied. Therefore, expenditure per capita per year is more meaningful than the price per cubic metre.

Multiplying the cubic metre prices with the average water consumption per head per day reveals the amount of expenditure per head per year.

The following graphic shows the values from 2012 and in comparison the values from the last VEWA study (2007, price indexed and adjusted for purchasing power). The water prices per cubic metre fell over this period in particular in Germany (from €2.07 to €1.94), in England/Wales (from €1.55 to €1.40) and in the Netherlands (from €1.82 to €1.51), whilst they rose in Poland.

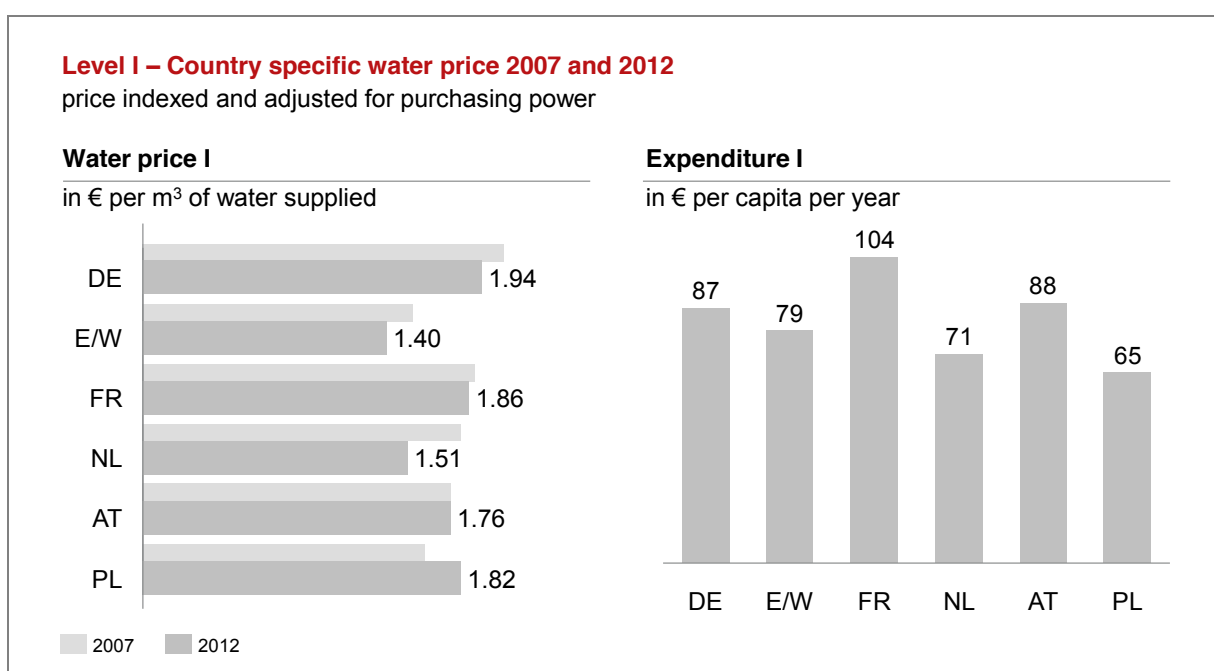


Fig. 57: Level I – Country specific water price 2007 and 2012¹⁶⁹

¹⁶⁸ In contrast to Germany, France, the Netherlands and Austria, no one-off construction cost contributions are collected in England and Wales. It was not possible to obtain information for Poland. One-time construction measures, which are partly financed in Germany and France through construction cost contributions, are included in the calculation of the wastewater price in England and Wales. Therefore, when looking at and interpreting the results, one must take into account that the average price in Germany, France, the Netherlands, Austria and possibly Poland could be slightly higher if construction cost contributions are taken into account, insofar as new construction measures are undertaken.

¹⁶⁹ Germany: BDEW Entwicklung der Trinkwasserpreise 2000-2009 und Preisveränderungsraten beim Trinkwasser – jährliche Veränderung; England/Wales: OFWAT (publisher) Average household bills 2011-12; own calculation; France: Ministry of Environment, Base de données SISPEA; Netherlands: VEWIN (publisher), Drinking Water Fact Sheet 2012; Austria: own research of Kommunalkredit Public Consulting; Poland: analysis by Izba Gospodarcza Wodociągi Polskie (IWGP).

A time series of the prices shows that the purchase power adjusted prices for water in England/Wales, the Netherlands and in Germany have fallen significantly since 2010.

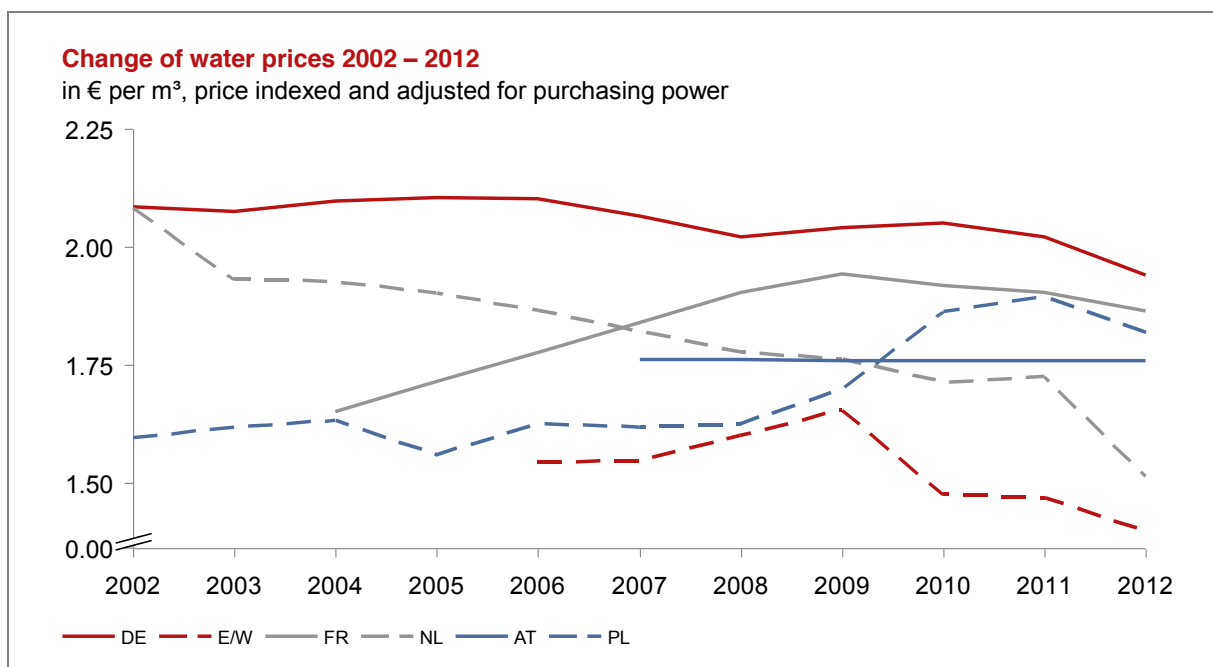


Fig. 58: Change of water prices 2002 – 2012

In addition, expenditure per capita has been calculated as a proportion of disposable annual income. The highest values are seen in France and Poland. In the Netherlands, England/Wales, Austria and Germany, the values are lower.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level I	0.30	0.33	0.40	0.24	0.31	0.43

Table 1: Water prices level I – proportion of disposable income 2012

6.2.2 Level II – cost recovery water price

At level II, public grants from the municipalities, regions, Länder or provinces or Départments respectively as well as from state, federal and EU level in the area of water supply are integrated into the model in order to calculate cost recovery prices. This means that the grants paid from the public authorities are added to the revenues from the water supply, which are financed from the prices, in order to calculate the (notional) average price at level II.

The prices at level II do not contain those grants which are already financed by households via levies (e.g. investment grants financed by the wastewater levy of the German wastewater disposal industry). Otherwise, these payments would be counted twice, at level I and level II.

In Germany, grants¹⁷⁰ (proportionately limited for households) in the amount of €101m are included, for England and Wales the figure is €580m, for France €402m, in Austria €41m and in Poland €361m; in the Netherlands, there are no grants in the water sector (see Section 5.3.2 grants).

The average price at level II is calculated by adding the grants to the total revenues (from level I) from water supply of households, divided by the volume of water supplied to the households. The inclusion of grants leads to the following prices and expenditure at level II:

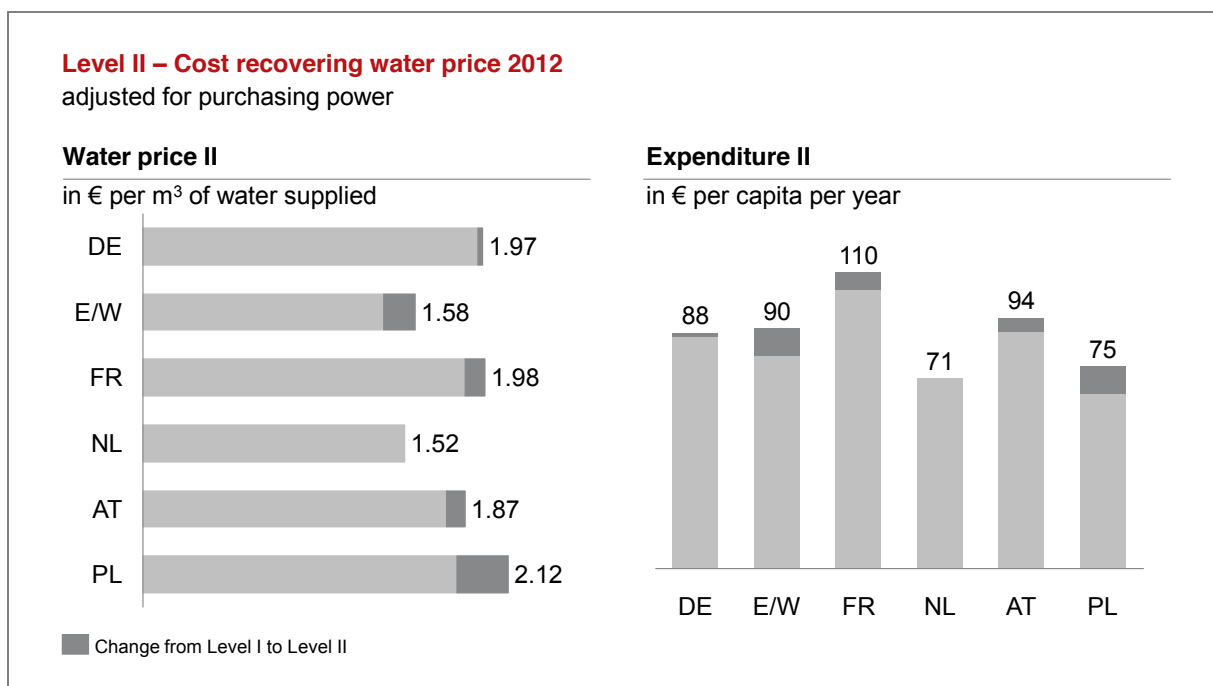


Fig. 59: Level II – Cost recovery water price 2012

Whilst the water price did not increase in comparison to level I in the Netherlands and only increased by 1.5% in Germany, the change in England/Wales, at +13.2%, in France, at +6.0%, in Austria, +6.0% and in Poland (especially due to EU grants) at 16.5%, is much greater.

In addition, expenditure per capita is calculated as a proportion of disposable annual income.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level II	0.30	0.37	0.43	0.24	0.33	0.50

Table 2: Water prices level II – proportion of disposable income 2012

The following graphic shows what proportion comes from revenues from household payments and what proportion comes from grants (pro rata for households).

¹⁷⁰ For the calculation, the average grants 1995-2012 were used. Sources as in Section 5.3.2.

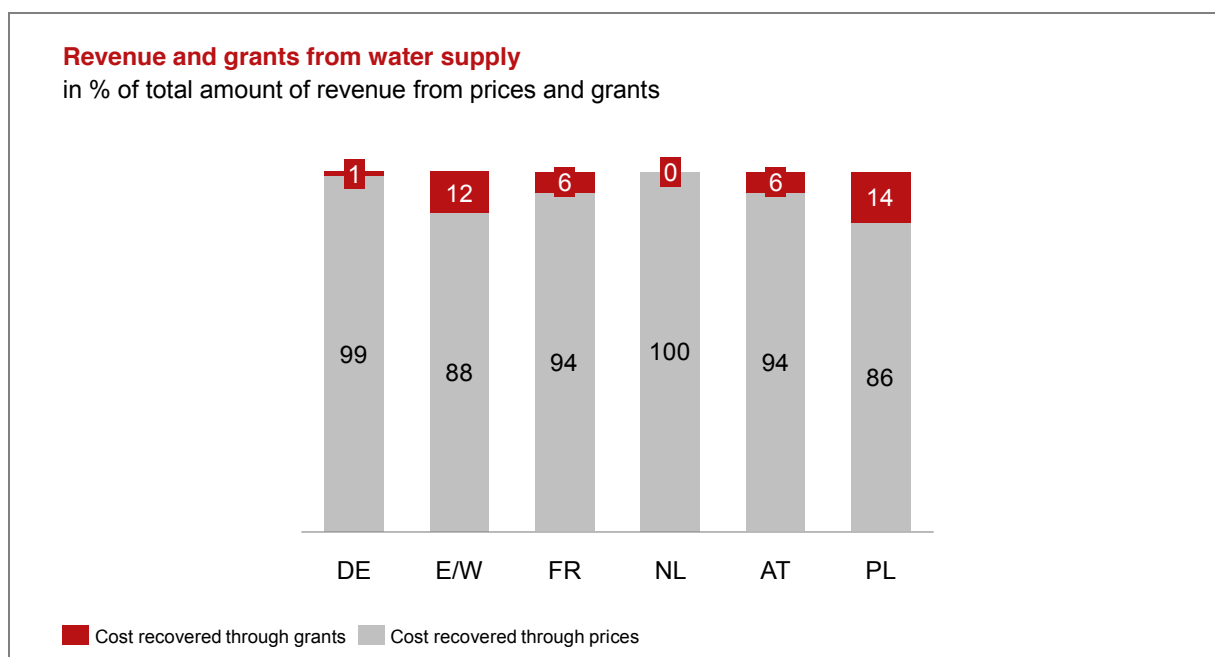


Fig. 60: Fees and grants from water supply¹⁷¹

6.2.3 Level III – water price at equal service levels

The difference that the level of service and quality makes to the water price is highlighted by the following matrix in which the water price is shown in relation to the quality of the pipeline network.

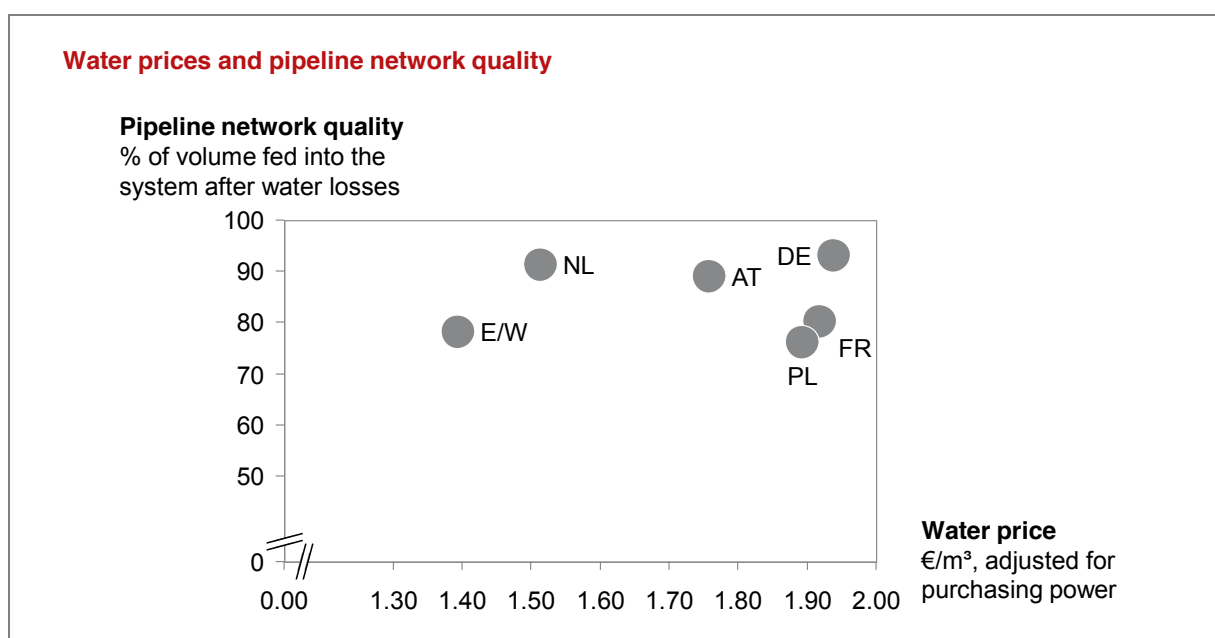


Fig. 61: Water prices and pipeline network quality

¹⁷¹ Own calculation.

In order to make allowances for these differences, in level III, a calculation is made as to how high the (notional) prices in the countries in the comparison would be if the water supply in all countries was at the same level of quality and service. As the European requirements cannot be applied as quantitative criteria, a uniform level of service is used as the basis.

For this purpose, parameters have been used which can be reliably quantified. These parameters represent opportunity costs of water losses as indicators of the condition of the pipelines as well as the running costs for installing meters. The drinking water quality and measures to preserve resources could not be included in the price comparison as no meaningful data on the countries in the comparison was available for a qualitative comparison (see qualitative comparison in Section 7).

In the case of water losses, substantial differences (see Sec. 4.1.2.) can be seen. In order to compare the sustainability of network renewal, the **opportunity costs for water losses** are calculated as lost revenue for the volume of water lost. In this context, a base level of 6% water loss is assumed. The calculation of the opportunity costs is based on the lost revenue (water price in litre per m³), proportionately for abstraction and treatment. The opportunity costs attributable to households alone are ascertained.

Equipping households with **meters** serves to control the water use and to enable billing for water according to the cost-by-cause principle. In Germany, France and Austria, nearly 100% of households are equipped with water meters; in the Netherlands the figure is 96%, in Poland 94% and in England/Wales only 43%. In order to make expenditure per head comparable, level III also takes into account which additional running payments are due for meter reading, billing etc, if 100% of households had meters installed. In England/Wales, for the 13.1 million households which would need to have meters installed, additional costs of €43 per household per year would be incurred, amounting to an overall additional sum of €562m per year. In Poland, additional costs of €15m per year would be due in respect of the 0.7m relevant households; in the Netherlands an extra €15m would be required for the 0.3m households.

An overview of the additional costs for the service and quality aspects of the water supply proportionately for households (according to volume of water supplied) is shown in the following table:

Additional expenditure for	DE (€m)	E/W (€m)	FR (€m)	NL (€m)	AT (€m)	PL (€m)
Opportunity cost of water losses in the pipeline network	19	263	457	14	10	187
Installation of meters	–	562	–	15	–	15
Total	19	825	457	29	10	202

Table 3: Water prices level III – additional expenditure at equal service levels

If one takes these additional costs into account, one arrives at the following estimated wastewater prices and expenditure per year in level III for the countries in the comparison.

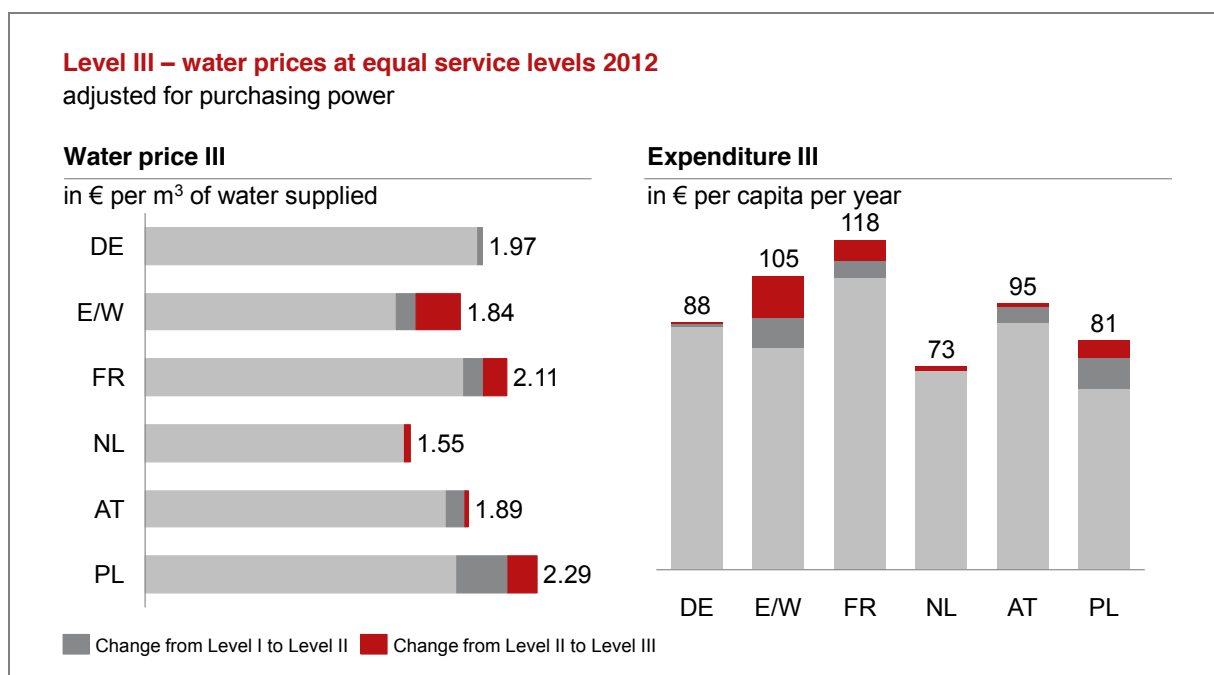


Fig. 62: Level III – Water prices at equal service levels 2012

It should be noted that the prices for level III are calculated hypothetically. They can therefore only be taken as an indication of the level to which water prices could climb on the basis of the specified assumptions.

In comparison to level II, some of the values for the individual countries have increased considerably: in Germany by 0.3%, in England/Wales by 16.6%, in France by 6.6%, in the Netherlands by 2.4%, in Austria by 1.4% and in Poland by 7.9%. Ultimately, one can conclude that expenditure per head for the water supply in Germany is lower than in England/Wales, France and Austria.

The proportion of disposable income accounted for by expenditure for water supply in level III is considerably higher in Poland in particular but also in France and in England/Wales than in the other countries under analysis.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level III	0.30	0.43	0.45	0.25	0.33	0.54

Table 4: Water prices level III – proportion of disposable income 2012

6.2.4 Summary of water price comparison

In summary, the water prices of the countries in the comparison on the three levels and their percentage change can be presented as follows¹⁷²:

Water prices	DE (€/m ³)	E/W (€/m ³)	FR (€/m ³)	NL (€/m ³)	AT (€/m ³)	PL (€/m ³)
Price Level I	1.94	1.40	1.86	1.51	1.76	1.82
Price Level II	1.97	1.58	1.98	1.52	1.87	2.12
Price Level III	1.97	1.84	2.11	1.55	1.89	2.29

Table 5: Water prices – comparison of levels I to III

Expenditure per capita for water	DE (€)	E/W (€)	FR (€)	NL (€)	AT (€)	PL (€)
Expenditure Level I	87	79	104	71	88	65
Expenditure Level II	88	90	110	71	94	75
Expenditure Level III	88	105	118	73	95	81

Table 6: Water prices – comparison of expenditure per capita per annum levels I to III

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level I	0.30	0.33	0.40	0.24	0.31	0.43
Proportion Level II	0.30	0.37	0.43	0.24	0.33	0.50
Proportion Level III	0.30	0.43	0.45	0.25	0.33	0.54

Table 7: Water prices – proportion of disposable income, comparison of levels I to III

Percentage change	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Increase Level I to II	1.5	13.2	6.1	0.1	6.0	16.5
Increase Level II to III	0.3	16.6	6.6	2.4	1.4	7.9

Table 8: Water prices – percentage change levels I to III

¹⁷² All countries have been adjusted to the level of German purchasing power.

6.3 Wastewater price comparison

6.3.1 Level I – country specific wastewater price

The first level contains the country specific average wastewater prices of wastewater disposal operators including sales tax, which are currently paid by households. The average wastewater price contains basic fees and volume based fees but no one-off contributions.¹⁷³ In Germany, the average price is based on the split method and the fresh water method of charging. In the Netherlands, it is not charges but taxes that are collected, which are determined in particular by the size of the household (see Section 5.1 calculation of prices). Multiplying the prices with the average water consumption per head per day reveals the amount of expenditure per head per year, which is more relevant in respect of the total burden on consumers due to differing usage behaviour.

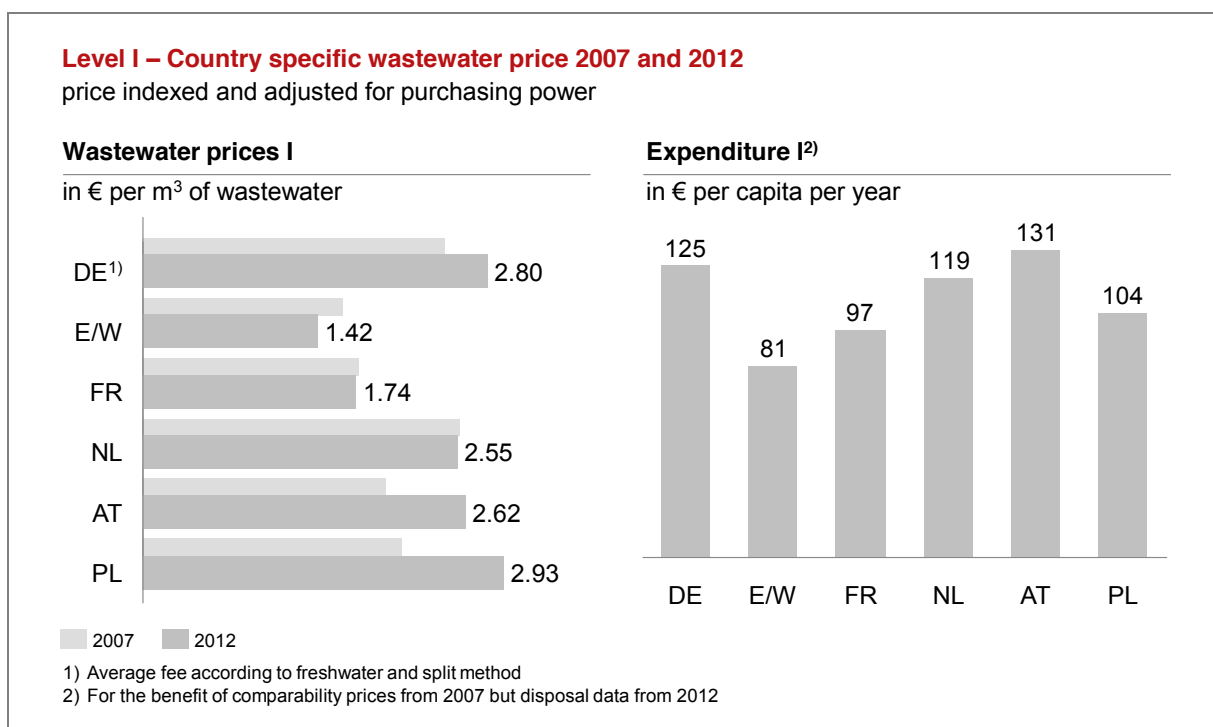


Fig. 63: Level I – Country specific wastewater price 2007 and 2012¹⁷⁴

Wastewater prices for 2012 are shown in relation to those from 2007. In this respect, increases can be observed in Germany (from €2.44 to €2.80), Austria (from €1.96 to €2.62) and Poland (from €2.10 to

¹⁷³ In contrast to Germany, France, the Netherlands and Austria, in England/Wales no one-off contributions are collected, rather all construction measures are included in the calculation of the wastewater prices (albeit largely financed by borrowing). It was not possible to obtain information for Poland. Therefore, when looking at and interpreting the results, one must take into account that the average price in Germany, France, the Netherlands, Austria and possibly Poland could be slightly higher if construction cost contributions are taken into account.

¹⁷⁴ Germany: Destatis, Tabelle Entgelt für die Entsorgung von Abwasser aus privaten Haushalten 2012; England/Wales: OFWAT (publisher), Average household bills 2011-12; own calculation; France: Ministry of Environment, Base de données SISPEA; Netherlands: CBS Statline and own calculation; Austria: Statistik Austria, Austria: own research of Kommunalkredit Public Consulting; Poland: analysis by Izba Gospodarcza Wodociągi Polskie (IWGP).

€2.93). In contrast, prices fell in England/Wales by €0.20. Prices in France and in the Netherlands remained at the level they were in the last study.

Looking at the change in wastewater prices over time also shows that they have fallen considerably in England/Wales. In France and the Netherlands, they are at a similar level to 2007. In contrast, prices have risen in Germany, Austria and Poland.

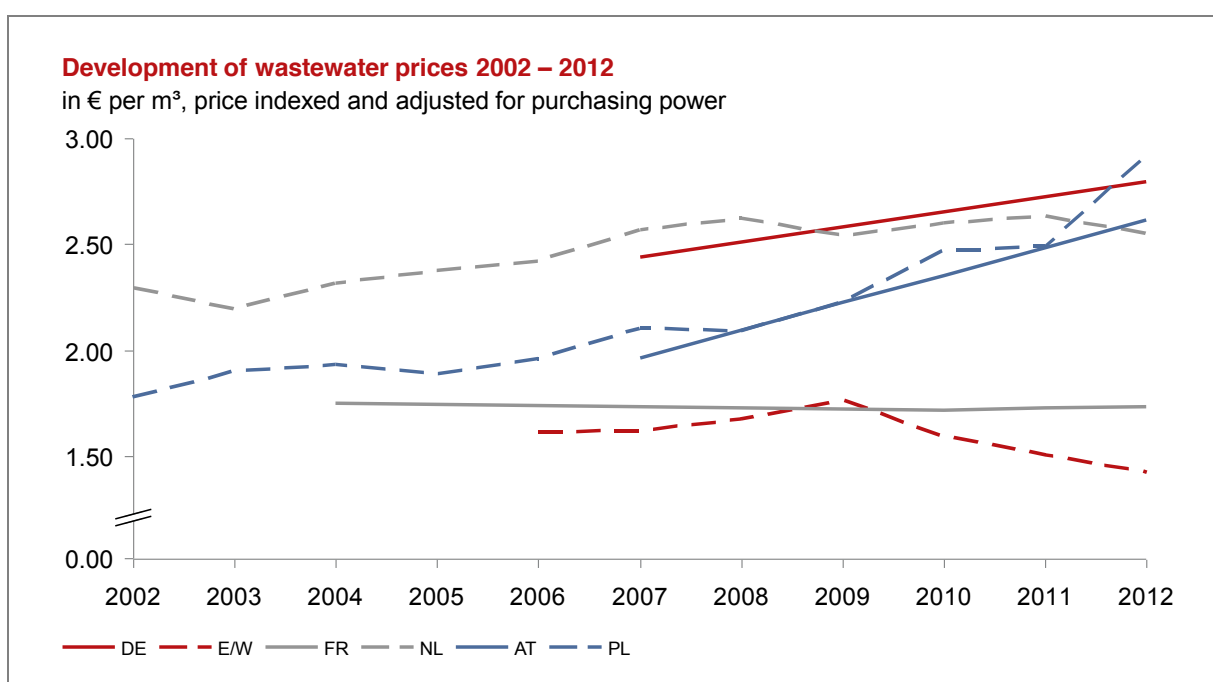


Fig. 64: Wastewater prices 2002 – 2012

Expenditure per head as a proportion of disposable income in Germany, the Netherlands and Austria is in the middle of the range; in Poland the expenditure is higher, in England/Wales and in France, however, expenditure is lower.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level I	0.43	0.33	0.37	0.41	0.46	0.69

Table 9: Wastewater prices level I – proportion of disposable income 2012

6.3.2 Level II – cost recovery wastewater price

At the second level, public grants from the municipalities, regions, Länder or provinces or départements respectively as well as from state, federal and EU level in the area of wastewater disposal are included in the prices in order to obtain cost recovery prices. In Germany, grants (proportionately for house-

holds) in the amount of €441m are included, for England/Wales, €1,051m, for France €1,387m, for the Netherlands €210m, for Austria €205m and for Poland €549m.¹⁷⁵

Average prices in the area of wastewater can also be calculated by adding the grants to the total revenues from wastewater disposal of households (from level I), proportionately for the volume of domestic sewage produced.

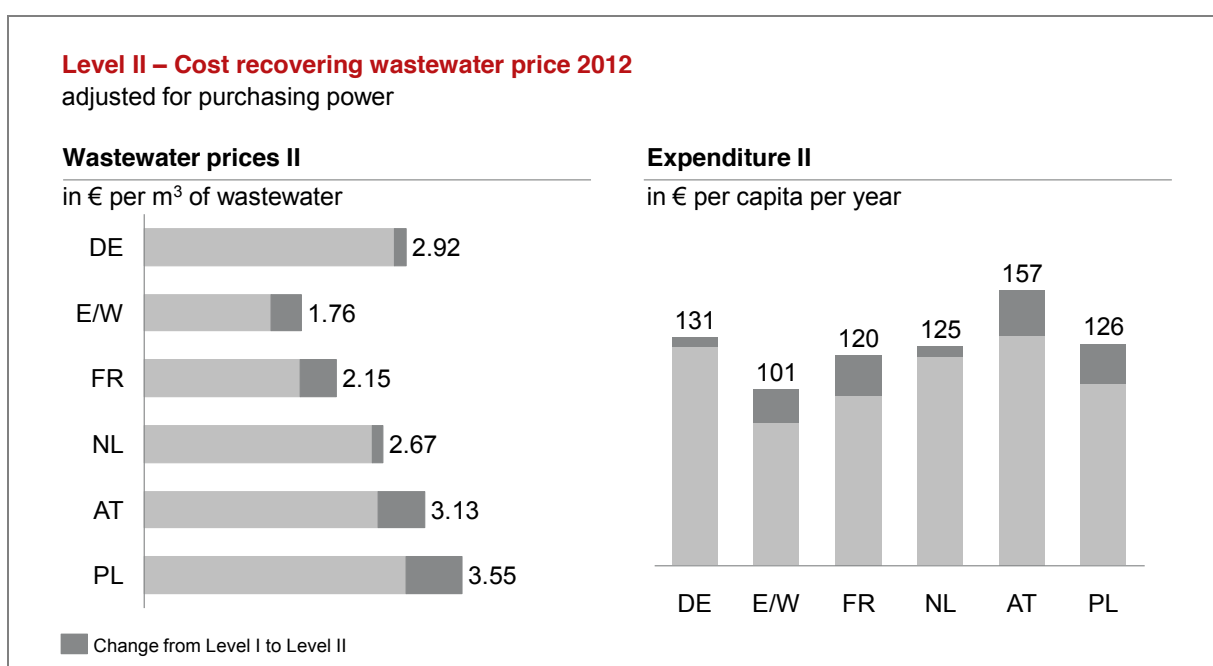


Fig. 65: Level II – Cost recovery wastewater price 2012¹⁷⁶

When grants are taken into account, wastewater prices change more markedly compared to level I than water prices do. This can be traced back to the fact that the grants in the area of wastewater disposal account for around three quarters of the total grants to water supply and wastewater disposal.

Whilst the wastewater price only increased in Germany by 5% compared to level I, the change in the other countries is in part much greater: in England/Wales and France +24%, in the Netherlands +5%, in Austria +20% and in Poland +21%.

Expenditure per capita at level II was calculated as a proportion of disposable annual income.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level II	0.45	0.41	0.46	0.46	0.55	0.84

Table 10: Wastewater prices level II – proportion of disposable income 2012

¹⁷⁵ For the calculation, the average grants 1995-2012 were used. Sources as in Section 5.3.2.

¹⁷⁶ Own calculation.

The following graphic shows what proportion comes from revenues from households' payments and what proportion comes from grants (pro rata for households).

The rate of cost recovery in wastewater disposal is considerably lower than that in water supply. In this respect, just under 20% is covered in England/Wales, France and Poland, in Austria the figure is 18%, in the Netherlands 10% and in Germany 4%.

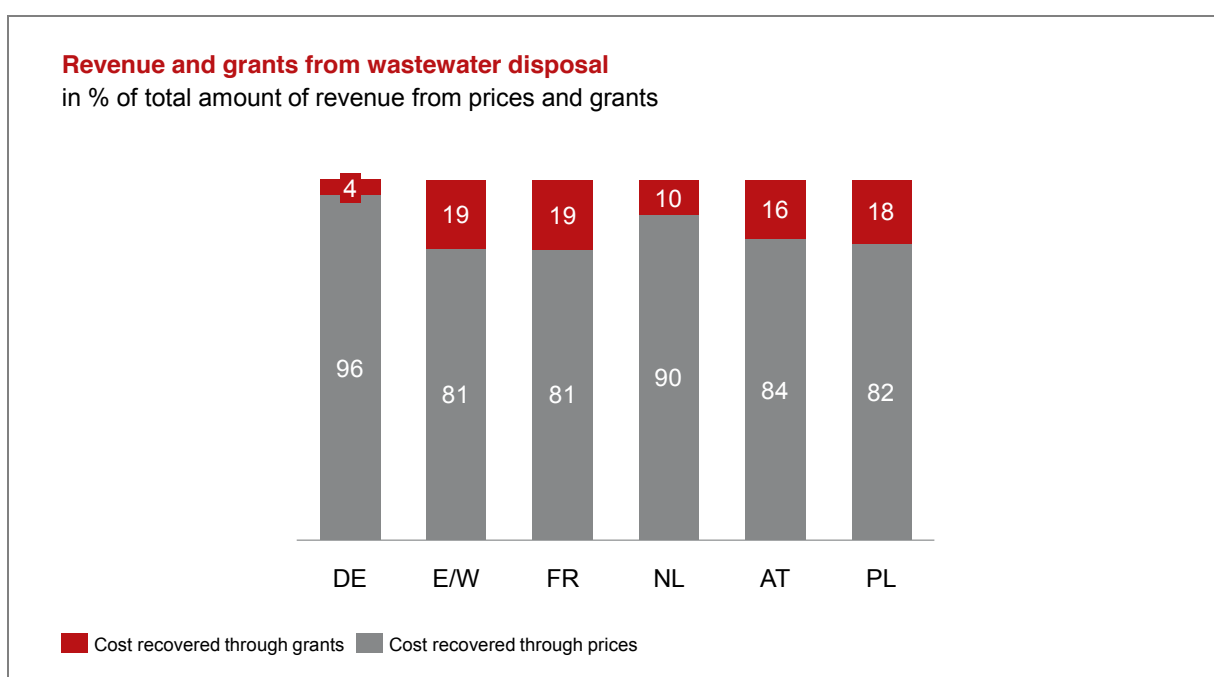


Fig. 66: Fees and grants from wastewater disposal¹⁷⁷

6.3.3 Level III – wastewater prices at equal service levels

In level III, the wastewater price will be ascertained which would result if there was an equal level of service in all countries. For level III, selected parameters have been used which can be reliably quantified. As such, the service of the wastewater industry is compared in terms of the rate of connection to treatment plants, the sustainability of the renewal of the sewer network and the quality of the wastewater treatment. No account is taken, due to lack of data, of, amongst other things, the more stringent wastewater treatment standards as well as the rainwater collection with sanitary sewers and the rainwater treatment plants, which so far only exist to a significant extent in Germany, the Netherlands and Poland.

In order to calculate the wastewater prices at level III, the costs for achieving a uniform standard of service in relation to the three aspects under consideration are added and limited proportionately to households. The difference that the level of service and quality makes to the wastewater price is highlighted by the following matrix in which the wastewater price is shown, by way of example, in relation to the volume of wastewater treated at the tertiary treatment stage.

¹⁷⁷ Own calculation.

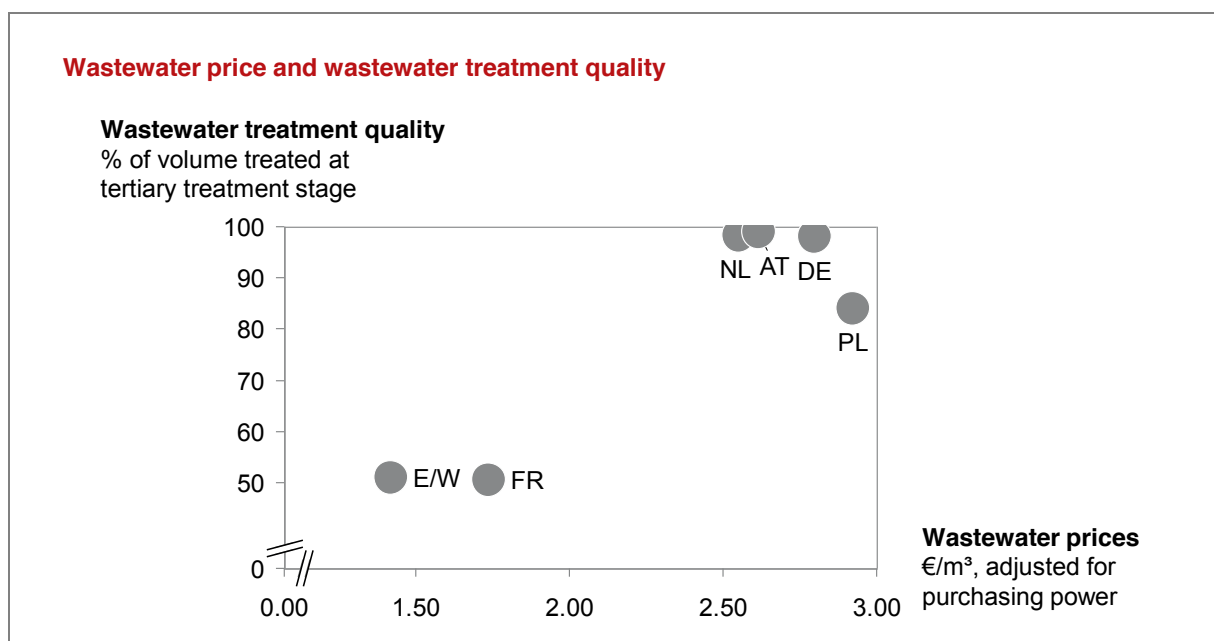


Fig. 67: Wastewater price and proportion of wastewater treatment with tertiary treatment stage

For the harmonisation of the **rate of connection to treatment plants**, a simulation is performed to assume that all residents of a country which are connected to the sewer network are also connected to wastewater treatment facilities. If the rates of connection were to be harmonised, in Germany 0.6 million residents, in England/Wales 0.3 million residents, in France 8.4 million residents and in Poland 0.04 million residents would have to be connected for the first time to treatment plants. The investment requirement for each additional resident connected to wastewater treatment was calculated by dividing the asset value of the treatment plants (proportionately for households) in the respective countries by the number of connected residents. The required investment was spread over 25 years and an interest rate was applied. According to this calculation, the annual payments would be €169m for Germany, €0.18m for England/Wales, €880m for France and €5m for Poland.

It was not taken into account that in order to increase the rate of connection to treatment plants, the sewer network would possibly also have to be extended in order to connect all sewers to feeder pipes for treatment plants.

The **sustainability of the renewal of the sewer network** was calculated on the basis of the optimum renewal strategy. For this purpose, the useful life of the sewer network is assumed to be 100 years, which results in a renewal rate of 1% per year. In order to achieve this renewal rate, an additional estimated investment of €1.3bn would be required in Germany, of €1.8bn in England/Wales and of €0.3bn in Austria. France, the Netherlands and Poland have undertaken great renewal efforts in the sewer network in the period under observation and are therefore above the assumption used here, of 1% sewer network renewal.

The **quality of the wastewater treatment** was compared on the basis of the approach of a study conducted by the European Environment Agency (EEA) on the removal of the nutrients phosphorus and nitrogen (see Section 3.3.3). To this end, the removal of pollution loads was made comparable. In the Netherlands, Austria and Poland, the emission of phosphorus from treatment plants and sewers was the lowest, at 0.06 kilograms per resident (Netherlands and Austria) and 0.08 kilograms per resident (Poland). At 0.35 kilograms per resident, England has the highest level of phosphorus emissions,

followed by France, at 0.26 and Germany, at 0.21 kilograms. The nitrogen emissions from treatment plants and sewers per m³ vary between 1.39 kilograms (Germany) and 2.29 kilograms (England/Wales).¹⁷⁸ On the basis of an analysis performed by the DWA working group "Cost analysis in wastewater technology", the costs for removal of phosphorus were set at €12.60 per kg whilst the costs for removal of nitrogen were set at €6.30 per kg (as at 1998 – 2001).¹⁷⁹ In order to reduce the nutrient concentration per m³ of treated wastewater to the level in Germany, the assumptions above would mean that England and Wales would incur costs of around €418 million, France would have costs of €371 million, the Netherlands would have costs of €78 million, Austria of €33 million and Poland of €13 million.¹⁸⁰

The estimated additional expenditure for the four service level variables in question are shown in the following table:

Additional expenditure for	DE (€m)	E/W (€m)	FR (€m)	NL (€m)	AT (€m)	PL (€m)
Rate of connection to treatment plants	169	18	880	–	–	5
Sustainability of the renewal of the sewer network	1,267	1,839	–	–	318	–
Quality of wastewater treatment	0	418	371	78	33	13
Total	1,436	2,275	1,251	78	351	1,006

Table 11: Wastewater prices level III – additional cost at equal service levels

If one combines the additional costs of the three regarded aspects of wastewater disposal and limits them proportionately (according to sewage volumes) to households, one arrives at the following wastewater prices or expenditure per year in level III for the countries in the comparison:

¹⁷⁸ In this context, reference should be made once more to the fact that the actual rate of removal in Germany is far above the value stated here. For the purposes of establishing comparability, the same approach was used for all countries.

¹⁷⁹ Grünebaum, Hinweise zu Produktkosten der kommunalen Abwasserbehandlung, 2006. The values were extrapolated for 2012.

¹⁸⁰ Calculation according to P. Kristensen, Outlooks on Nutrient Discharges in Europe from Urban Waste Water Treatment Plants, final draft, March 2004; European Environmental Agency (Website), http://www.eea.europa.eu/data-and-maps/daviz/phosphorus-emission-intensity-of-domestic-sector#tab-chart_2, for more information see Section 7.

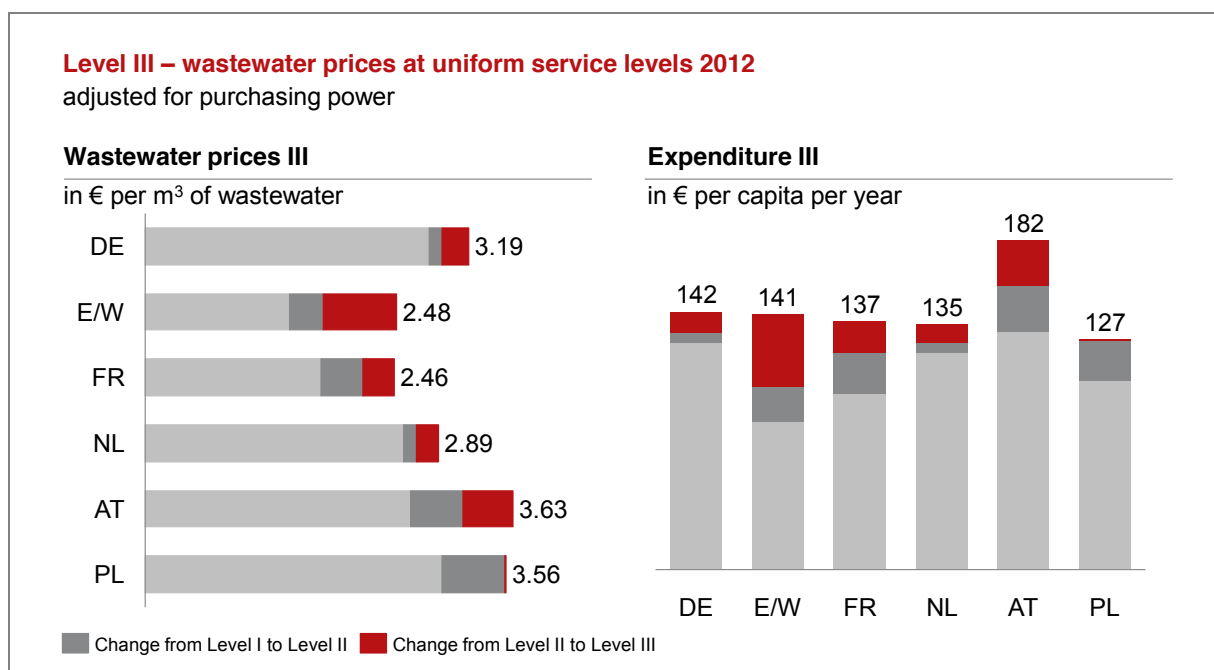


Fig. 68: Level III – Wastewater prices at equal service levels 2012¹⁸¹

It should be noted that the prices for level III are calculated hypothetically. They can therefore only be taken as an indication of the level which wastewater prices could reach on the basis of the specified assumptions. In comparison to level II, the values have increased considerably: in Germany by 9.1%, in England/Wales by 41.4%, in France by 14.5%, in the Netherlands by 2.5%, in Austria by 15.8% and in Poland by 0.2%.

Behind the German prices at level III are high quality standard, however these cannot be accounted for in the prices of other countries due to a lack of quantifiable data. These include, as mentioned above, rainwater collection and treatment but also additional wastewater treatment standards.

One can conclude from level III that the expenditure per capita in Germany, if one assumes an equal level of service, is in the middle of the range for Europe.

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level III	0.49	0.58	0.53	0.47	0.64	0.84

Table 12: Wastewater prices level III – proportion of disposable income 2012

¹⁸¹ Own calculation.

6.3.4 Summary of wastewater price comparison

In summary, the wastewater prices for the countries in the comparison for the three levels and their percentage change can be represented as follows¹⁸²:

Wastewater prices	DE (€/m³)	E/W (€/m³)	FR (€/m³)	NL (€/m³)	AT (€/m³)	PL (€/m³)
Price Level I	2.80	1.42	1.74	2.55	2.62	2.93
Price Level II	2.92	1.76	2.15	2.82	3.13	3.55
Price Level III	3.19	2.48	2.46	2.89	3.63	3.56

Table 13: Wastewater prices – comparison of levels I to III

Expenditure per capital for wastewater	DE (€)	E/W (€)	FR (€)	NL (€)	AT (€)	PL (€)
Expenditure Level I	125	81	97	119	131	104
Expenditure Level II	131	101	120	125	157	126
Expenditure Level III	142	141	137	135	182	127

Table 14: Wastewater prices – comparison of expenditure per capita per annum levels I to III

Proportion of disposable income	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Proportion Level I	0.43	0.33	0.37	0.41	0.46	0.69
Proportion Level II	0.45	0.41	0.46	0.46	0.55	0.84
Proportion Level III	0.49	0.58	0.53	0.47	0.64	0.84

Table 15: Wastewater prices – proportion of disposable income, levels I to III in comparison

Percentage change in the values	DE (%)	E/W (%)	FR (%)	NL (%)	AT (%)	PL (%)
Increase Level I to II	4.5	23.7	23.7	10.5	19.6	21.3
Increase Level II to III	9.1	41.4	14.5	2.5	15.8	0.2

Table 16: Wastewater prices – percentage change levels I to III

¹⁸² The adjustment of the purchasing price level for Poland was not taken into account here.

7. Quality and Customer Satisfaction

In this section, the parameters for service and quality are compared which are relevant in respect of the level of water supply and wastewater in the countries but could not be quantified in the multi-level price model above. The service and quality parameters for water protection, drinking water supply and wastewater disposal are explained using the implementation reports of the respective EU directives.

7.1 Water protection

The European Union today has a prominent role in environmental protection and therefore the quality of water supply. This also manifests itself in the European foundations of water law.

The cornerstone of European water protection law is the EU Water Framework Directive (WFD). It introduced a uniform and cross-national management of waters with the objective of ensuring a good status of the waters. The Water Framework Directive is supplemented by so-called daughter directives, the Groundwater Directive and the Priority Substances Directive. In addition, further directives exist, such as the Nitrates Directive, the Urban Wastewater Directive and the Floods Directive.

The objective of the "Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy" (Water Framework Directive, abbreviated to WFD) is to achieve a good ecological and chemical status for surface waters and to bring groundwater to a good chemical and quantitative status by 2015 (or under exceptional circumstances by 2027 at the latest). Furthermore, the intention was to create a harmonised water protection concept on a European level and bring together the previously differing water law policies and legislative acts.¹⁸³

When setting the measures to be used for the protection of waters, the emission and immission principle is applied (combined approach). According to the emission principle, irrespective of the status of the receiving water, uniform requirements will be determined, based on technical standards. The immission approach establishes protection measures such as the addition of treatment stages in a treatment plant, which are solely derived from the status of the water.

The Water Framework Directive is designed according to the geographical boundaries of river basin districts, as all pollutants in surface waters which do not settle as sediment in the bed of the water, end up in the estuary, i.e. in the next largest water in each case and ultimately in the sea. The Framework Directive is also intended to achieve a coordinated management of waters within the river basin districts across state and country borders.

The member states were required, amongst other things, to ensure that by 2010, using the polluter pays principle, prices and fees for water services are calculated according to the cost-recovery principle. A further criterion was that environmental and resource costs be taken into account. Thus, the cost-recovery principle will be of great significance for water prices in future.

¹⁸³ The WFD has since been amended by Directive 2008/32/EC (March 2008, minor amendments), 2008/105/EC (December 2008) and 2009/31/EC (April 2009).

7.1.1 Transposition of the Water Framework Directive into national law

The WFD was supposed to have been transposed into national law by the end of 2003. Only a few of the EU member states managed this before the deadline.

In **Germany**, the Directive was implemented by amending the German Water Resources Act (Wasserhaushaltsgesetz, WHG) and the water acts within the federal Länder as well as by passing state ordinances. The amended German Water Resources Act came into force on time in June 2002. In the German Water Resources Act, no comprehensive implementation of the WFD was possible due to the competence of the federal government to enact framework legislation (Article 75 German Constitution). Only the essential principles of the Directive could be incorporated into the federal legislation. In order to regulate further issues, instructions were given to the Länder. All German Länder have since modified their water laws to complete implementation of the Directive.

In **England/Wales** the introduction of the Water Environment Regulations 2003 created the legal framework for an implementation of the WFD. The approaches and thresholds for the reviewing, classification and monitoring in the protection of waters were set out in the River Basins Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2009. These were later replaced by the 2010 Standards Directions.

In **France** the WFD was transposed into French law through the Loi n° 2004 – 338 of 21 April 2004. Individual points, such as the management on the level of the river basin district as well as the polluter pays principle, had already been established in national laws (Loi n°64-1245 du 16 décembre 1964, Loi n°92-3 du 3 janvier 1992 sur l'eau), independently of the Directive. Existing laws were additionally strengthened on 30 December 2006 by the Loi n°2006-1772.

In the **Netherlands** the already existing Water Management and Environmental Management Acts were extended in 2005 through the WFD Transposition Act in order to comply with the requirements of the WFD. Quality and monitoring standards were regulated in 2009 in the Decree on Quality Standards and Monitoring for water.

The WFD was transposed into national law in **Austria** in 2003 with the Austrian Water Act amendment 2003, Federal Law Gazette I No. 112/2003. Furthermore, in 2006, the requirements for monitoring in Austria were established with the Ordinance on the Monitoring of the Status of Waters (GZÜV, Federal Law Gazette II No. 479/2006, amendment with Federal Law Gazette II No. 465/2010) and the existing Austrian monitoring programmes were adjusted accordingly.

In **Poland**, the essential principles for the implementation of the WFD were established as early as 2001 through the modification of the Water Law (OJ of 2001, No. 115, item 1229 with amendments). In addition, the Environmental Protection Laws (OJ of 2001 No. 62, item 627 with amendments) and the Public Water Supply Act and Public Waste Water Collection Act (OJ of 2001, No. 72, item 747 with amendments) were expanded. An ordinance of the Polish Ministry of the Environment passed in 2009 forms the basis for the creation of the management plans.

In the opinion of the Commission, the Polish water protection regulations so far introduced have substantial deficiencies. In a press release of February 2013, after Poland had reacted to several written

notifications only with insufficient corrective measures, the Commission announced that it would pursue an action in this matter¹⁸⁴.

7.1.2 Monitoring programmes of the Water Framework Directive

Parallel to the implementation into national law, the first inventory was undertaken as to the current state of and pressures on waters up to 2004. The creation of programmes to monitor the status of waters (surface waters and ground waters) and the setting up of a monitoring network was supposed to be completed by 2007. The Commission is convinced that an efficient monitoring process is the only way to ascertain whether the targets of the Water Framework Directive have been achieved by 2015. All of the countries examined here have submitted their national reports on the monitoring programmes, however all only did so after expiry of the deadline in mid-March 2007. The Netherlands and Austria were praised for the clarity of their reports.

In 2009, there were around 57,000 monitoring stations for surface waters and 51,000 for groundwater bodies. As in 2009, the highest numbers of monitoring stations for surface waters were, by some distance, in rivers. The countries with the highest number of monitoring stations for surface waters were the United Kingdom (35,211), Germany (9,228) and France (5,507). Relatively speaking, the United Kingdom has, by quite a margin, the highest density of monitoring stations for surface waters. This can certainly be attributed to the fact that in the UK – unlike in the other countries in the comparison – around two thirds of the volume of water extracted originates from surface waters.

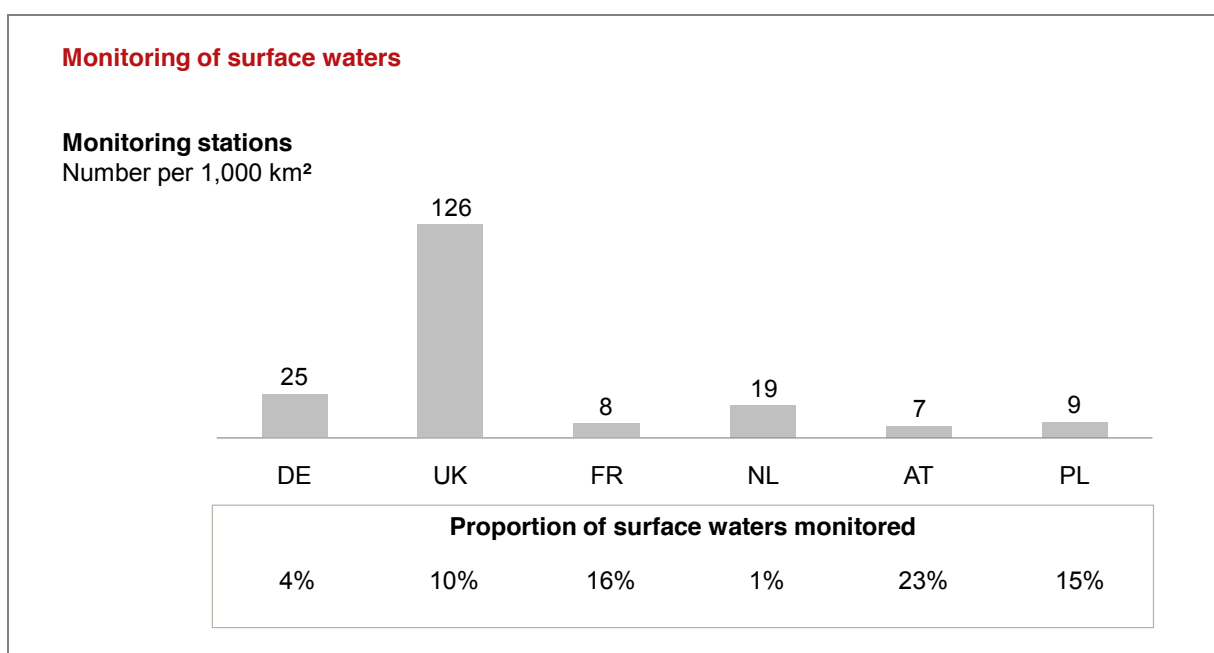


Fig. 69: Monitoring of surface waters¹⁸⁵

¹⁸⁴ Press release of the European Commission: Environment: Commission takes Poland to Court over water legislation, Brussels, 21 February 2013

¹⁸⁵ Commission Staff Working Document, European Overview (1/2), Accompanying the Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC), River Basin Management Plans

In absolute terms, Germany is the country with the most monitoring stations of groundwater bodies (7255 and 8963 respectively)¹⁸⁶, followed by Austria (2008 and 3383 respectively) and the United Kingdom (4061 and 1289 respectively), however in the UK there is a comparably high discrepancy between chemical and quantitative monitoring stations. In relative terms, both Austria and the Netherlands are strong in this area. They are followed by Germany, with 20 and 25 monitoring stations respectively per 1,000 km².

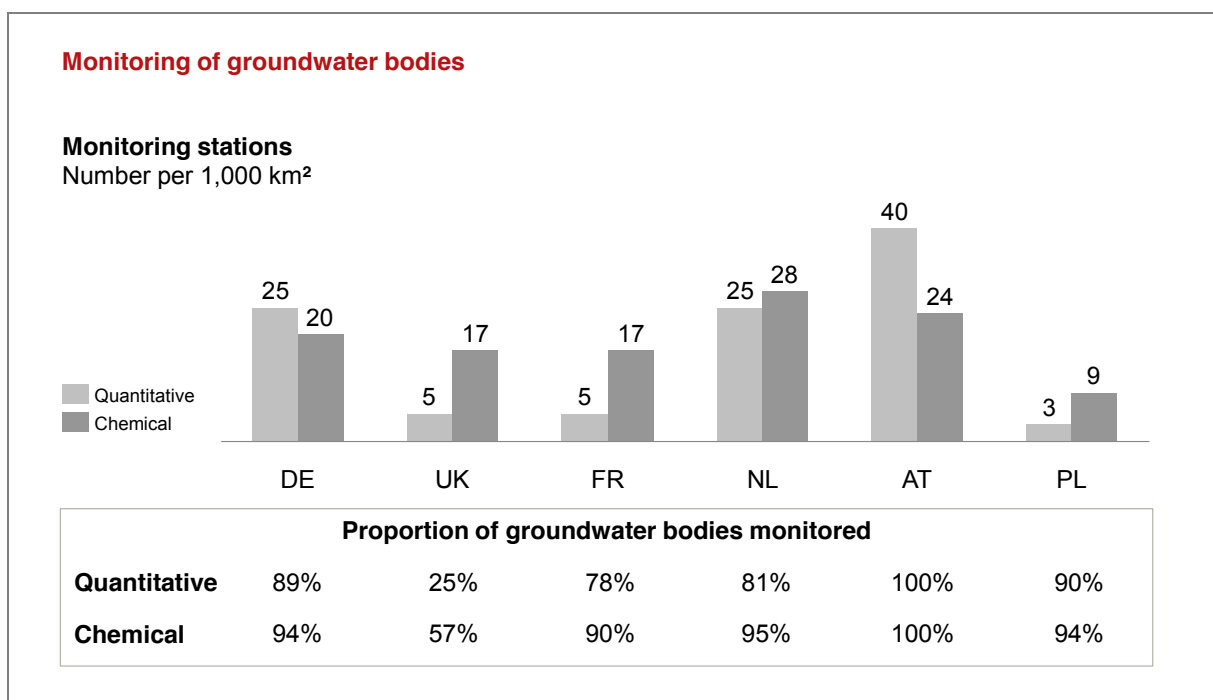


Fig. 70: Monitoring of groundwater bodies¹⁸⁷

In almost all of the countries presented here, a relatively high proportion of groundwater bodies is monitored both chemically and quantitatively. Only in Great Britain there is a high percentage of groundwater bodies without adequate monitoring.

7.1.3 Management plans and programmes of measures in the countries in the comparison

The member states were supposed to present management plans for the river basin districts by 2009 and introduce operational measures by 2012. The results of the inventory and the targets for 2015 are presented in the following.

The second management plan cycle is due to begin in 2015 and run until 2021. The third cycle will end in 2027, as will the final deadline for achieving the targets.

The most recent of three reports of the Commission on the implementation of the WFD¹⁸⁸ dates from 2012 and describes the status of adoption of the management plans and the respective 2009 reports.

¹⁸⁶ In each case, the first number refers to chemical monitoring stations and the second to quantitative monitoring stations.

¹⁸⁷ Commission Staff Working Document, European Overview (1/2), Accompanying the Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC), River Basin Management Plans

23 member states had adopted all management plans by the end of 2012 and forwarded in due time. Within that, of the expected 174 plans (status of assessment reporting) 124 had been received by the Commission of which 75% related to trans-boundary river basin districts.

The countries examined in this study have presented the nationally adopted management plans, albeit with a delay. Germany (10 plans), England/Wales (11), the Netherlands (4) and Austria (3) submitted all plans in 2010; France has been extended by one Schéma Directeur d'Aménagement et de Gestion des Eaux and, thus, in the future will have to submit 13 management plans. Poland only submitted its plans (10) in July 2011.

The management plans were assessed on the basis of the information reported by the member states and the electronic reporting through the Water Information System for Europe (WISE). According to the Commission, the data provided in the management plans on the chemical status of the surface waters is not clear enough. The chemical quality has improved markedly in the last 30 years, however the targets have not been achieved, in particular in respect of the substances prioritised in the WFD. Furthermore, the chemical status for 40% of the surface waters in the EU was reported as "unknown". In this context, the Commission sees considerable scope for improvement.

In its final assessment, the Commission assumes that improvements are to be expected but that the targets for good status by 2015 cannot be achieved for a considerable proportion of the water bodies. The Commission continues to see the most serious problems in the physical deterioration of the water ecosystems (in particular the excessive use of water) and the high degree of pollution. In addition, the Commission has determined deficiencies in the implementation of the content of the Directive.

In the following, the status of the surface waters and groundwater bodies for the relevant countries are compared, both with the status in 2009 and the expected status in 2015. In addition, information is given regarding the percentage of waters for which the status was unknown in 2009.

Surface waters

In respect of surface waters, there are serious differences between the countries under examination as far as the good ecological status and the good chemical status are concerned. The following graphic shows the classification of the surface waters according to their **ecological status** in 2009. In northern Germany and the Netherlands, there are river basin districts whose ecological status is less than good in over 90% of the water bodies. In river basin districts in northern France, southern Germany, Poland and southern England, 70 – 90% of the water bodies have a less than good status. This situation is reflected in the proportion of surface waters with good or very good status, which is very low, particularly in the Netherlands and in Germany.

¹⁸⁸ European Commission (publisher), Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC), River Basin Management Plans, COM(2021) 670 final, Brussels, 14 November 2012

Inventory – ecological status of rivers and lakes 2009

% of classified water bodies in a less than “good” status

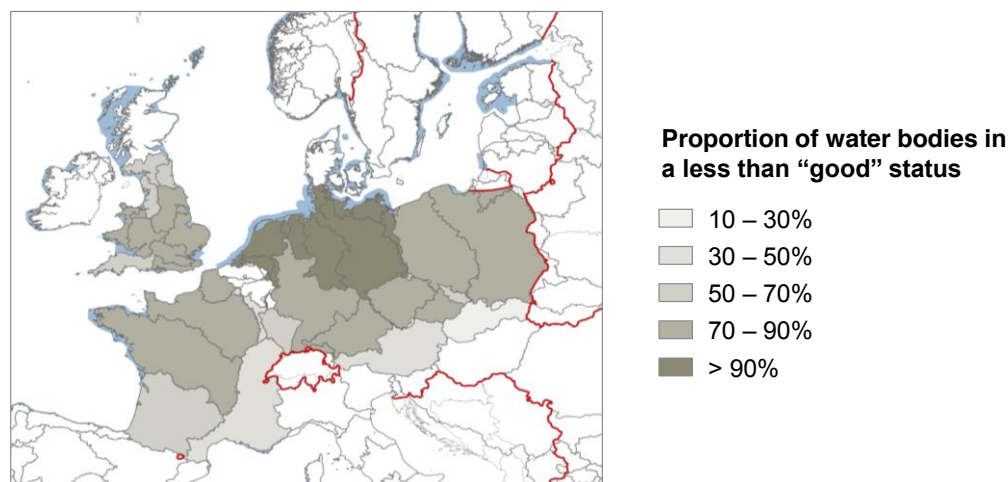


Fig. 71: Inventory – ecological status of rivers and lakes 2009¹⁸⁹

The following graphic compares the ecological status of the surface waters in 2009 with the targets for 2015. Poland reports a very high percentage of its waters as having an “unknown” ecological status.

Ecological status of surface waters 2009 and target 2015

in % of waters

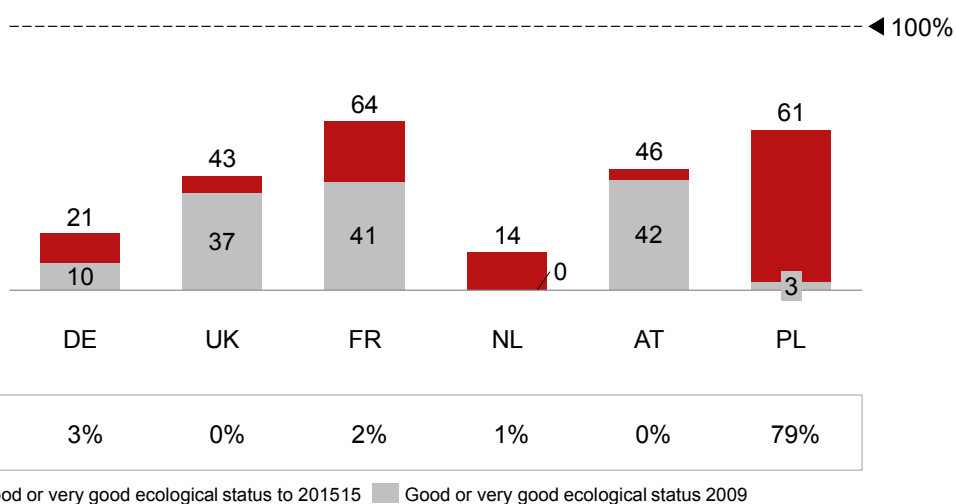


Fig. 72: Ecological status of surface waters 2009 and target 2015

¹⁸⁹ This and the following graphics: Commission Staff Working Document, European Overview (1/2), Accompanying the Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC), River Basin Management Plans; see also European Environment Agency, European waters – assessment of status and pressures, EEA Report No 8/2012

Article 4 WFD allows for a series of exemptions which relate both to the deadlines in 2015 and the target status of waters. The designation as **artificial or heavily modified bodies of surface water** is such an exemption. Environmental targets for these surface waters are the good chemical status and the good ecological potential. The designation of surface waters as artificial or heavily modified is only possible if the hydromorphological changes necessary to achieve a good ecological status would have significant adverse effects on navigation, drinking water supply, power generation, irrigation, water regulation, flood protection, land drainage etc., and if the measures necessary for the achievement of a good ecological status would considerably curtail the use of the water.

The following map shows that in particular in northern Germany, in the Netherlands and in the south of England, surface waters are primarily designated as "artificial" or "heavily modified".

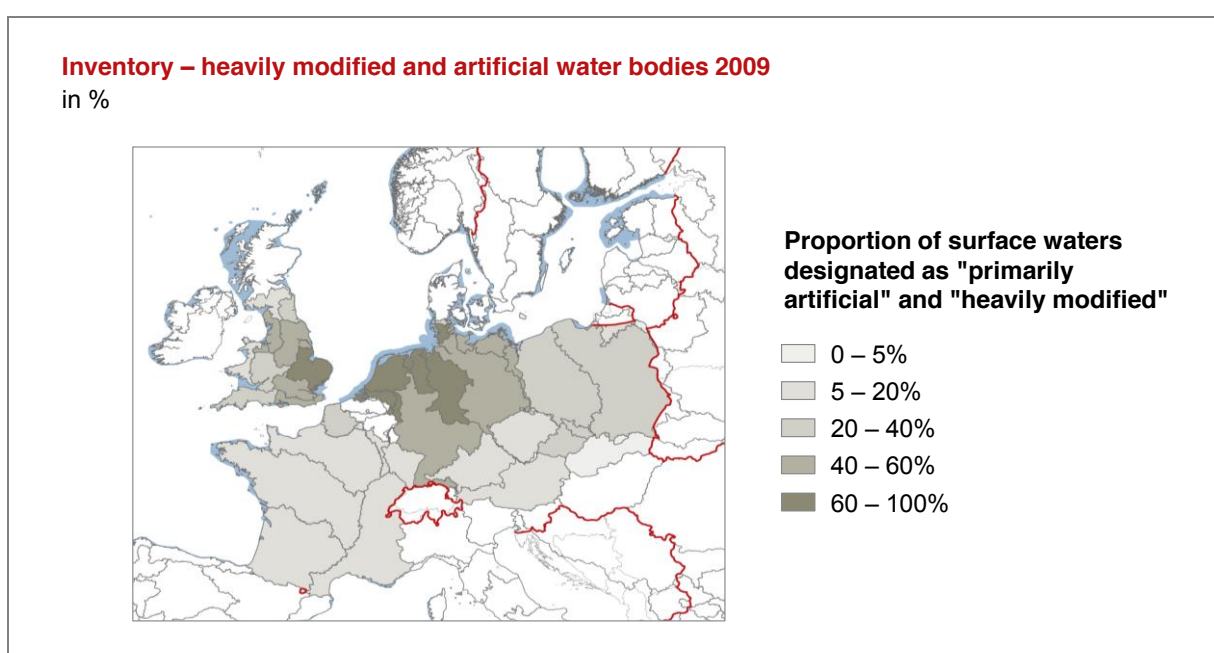


Fig. 73: Inventory – heavily modified and artificial water bodies¹⁹⁰

In addition to the ecological status of the surface waters, their **chemical status** is also recorded. In Poland in 2009, only 3% of the surface waters had a status of good or very good, in the United Kingdom and France only a third. France and the United Kingdom describe the chemical status of a high percentage of their waters as unknown (c.f. graphic below).

The targets for good ecological and chemical status established for Poland by 2015 seem to be hardly achievable.

¹⁹⁰ Commission Staff Working Document, European Overview (2/2), Accompanying the Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC), River Basin Management Plans, p. 19.

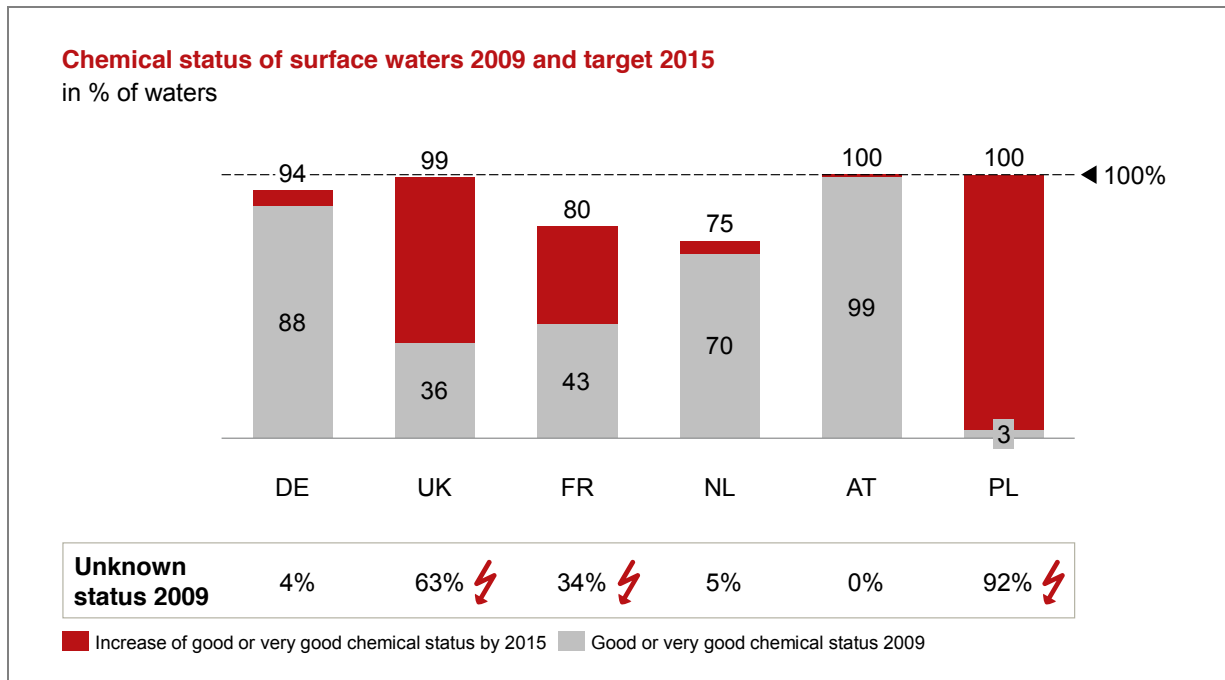


Fig. 74: Chemical status of groundwater 2009 and target 2015

Groundwater

For **groundwater bodies**, the qualitative and chemical status is reported. The good quantitative status in Great Britain and Poland is only at around 80% whilst in the other countries in the comparison it is at almost 100% (c.f. graphic below). It should be stressed that hardly any countries list groundwater bodies under the status "unknown". Nevertheless, the Commission still sees potential for improvement in many countries in respect of groundwater bodies, especially as regards the approaches and methodology used.

Quantitative status of groundwater 2009 and target 2015

in % of area of groundwater bodies

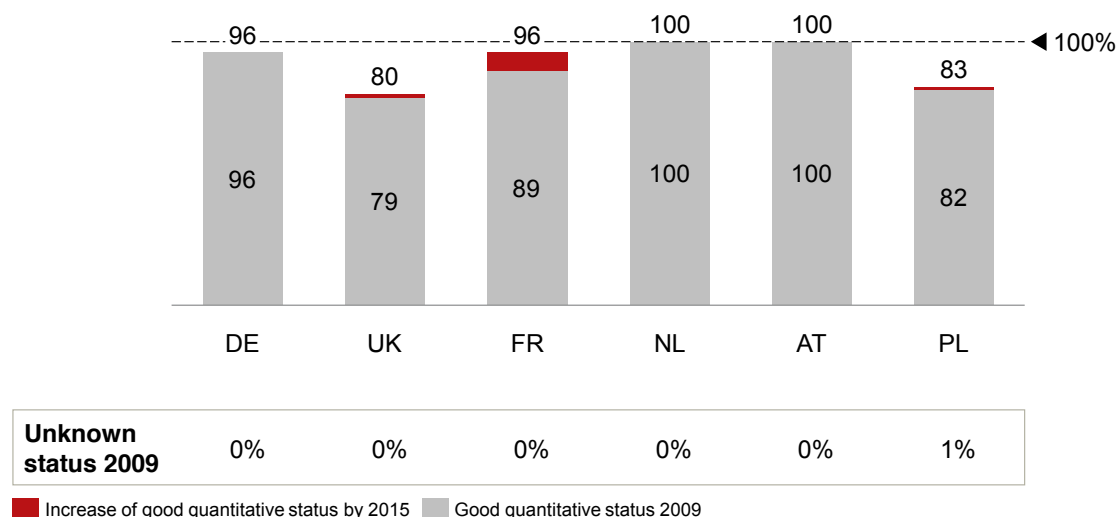


Fig. 75: Quantitative status of groundwater 2009 and target 2015

The chemical status of the bodies of groundwater is represented on the following map. Across large parts of England, the status of 50 to 90% of waters was not good; in northern France, the equivalent figure also exceeded 50%. In Germany, the chemical status of 30 to 50% of groundwater is not good across large parts of the country. In contrast, the values for Poland and Austria were under 10%. The EEA identifies the most frequent cause of poor chemical status to be nitrate pollution of groundwater. The EU Commission is preparing to bring a court action against Germany on the basis of insufficient implementation of the EU Nitrates Directive. The ECJ already found against France in this respect in 2014.

Inventory – chemical status of groundwater bodies

in % of area of groundwater bodies

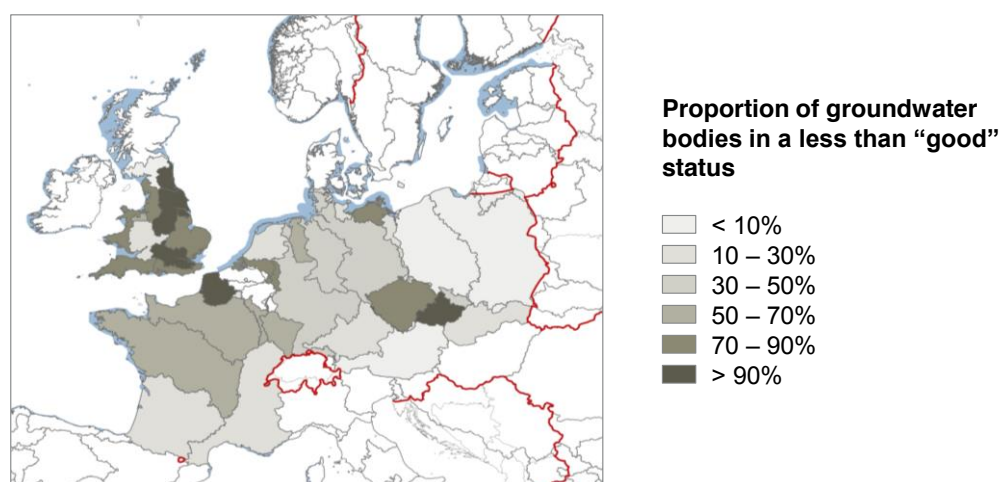


Fig. 76: Inventory – chemical status of the groundwater body

The following graphic shows the average status in 2009 with the 2015 targets.

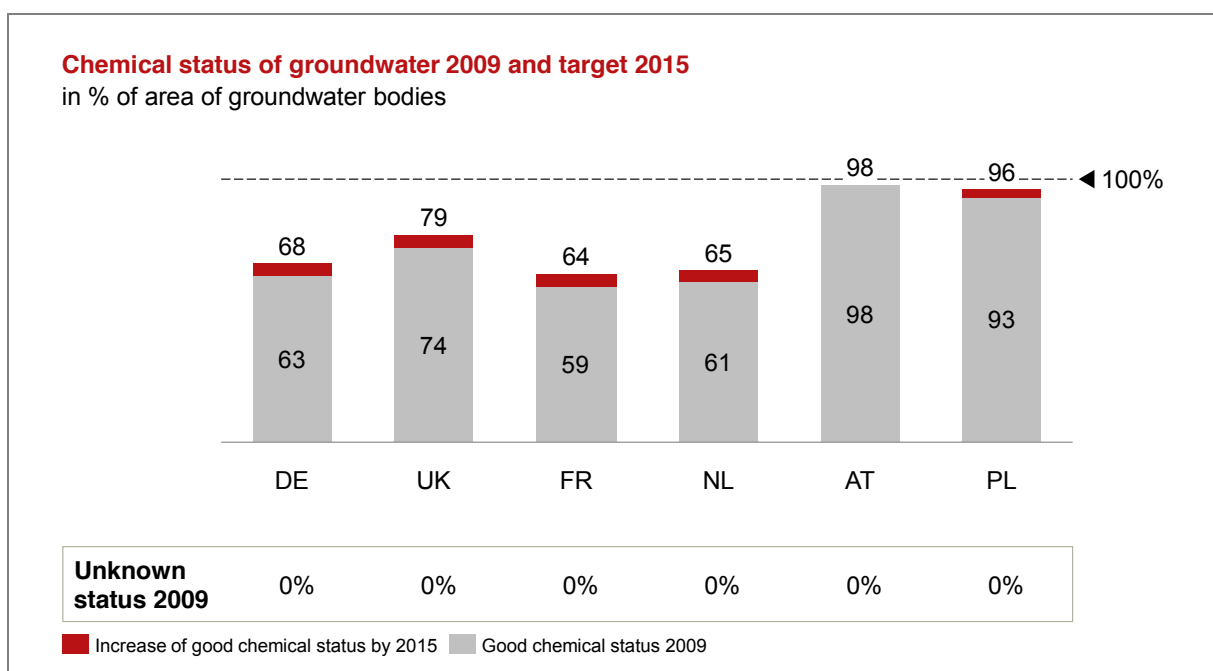


Fig. 77: Chemical status of groundwater 2009 and target 2015

7.2 Quality of the drinking water supply

In the following, the legal requirements of the European Union on drinking water quality and their implementation in the countries in the comparison will be described. Then, a comparison of the extent to which these requirements have been met will be presented.

The EU Drinking Water Directive was introduced in 1980 and revised in 1998 (European Directive 98/83/EC). It regulates the quality of drinking water intended for human consumption. The objective of the Drinking Water Directive is to ensure the water intended for human consumption is wholesome and clean and to ensure that a good status of waters is achieved.

The most important regulations for this study are the minimum requirements stipulated for microbiological and chemical quality as well as the indicator parameters:

- The member states must ensure that the water for human consumption meets the minimum requirements for the microbiological and chemical quality (heavy metals, nitrate and nitrite, pesticides, aromatic and halogenated hydrocarbons etc.).
- In addition, the Directive contains parameters with indicator function such as odour, taste, turbidity, colour and total organic carbon, TOC.

The Drinking Water Directive also specifies the following rules:

- The parametric values must be complied with where water intended for human consumption is made available from the public distribution network.

- Regular monitoring of the drinking water quality must be ensured. The Directive contains minimum requirements for monitoring. For example, the frequency of checks and the sampling points are stipulated.
- Member states can permit derogations from the stipulated parametric values for a maximum of three years, provided this does not represent a potential danger. No derogations are possible in respect of water for human consumption offered for sale in bottles.
- In order to ensure that consumers receive adequate information, the member states have to publish a report on the quality of drinking water every three years.

From 2007, a consultation process was carried out to review the Drinking Water Directive. In 2011, the European Commission decided, on the basis of that consultation, to bring the technical annexes up to date. In addition, increased efforts are made to extend the implementation of the Directive to small water supplies.

7.2.1 Legal transposition of the Drinking Water Directive in the countries in the comparison

The Directive on quality of water intended for human consumption is a piece of legislation which in principle is applicable throughout Europe. In some parts, however, it has been transposed into stricter national rules.

In **Germany**¹⁹¹, the requirements for the quality and monitoring of drinking water are regulated in the second amendment of the Drinking Water Ordinance (2001), through which the European Drinking Water Directive was transposed into national law.

The Drinking Water Ordinance applies without exception to all of the drinking water supply. It provides for stricter values for some of the parameters. Furthermore, there is the additional imperative to minimise pollutants as one of the key principles of German water management.

The monitoring of compliance with the prescribed standards is the responsibility of the water supply companies, which provide the findings of their analyses to the health authorities. The health authorities also undertake unannounced sampling.

In **England/Wales**¹⁹² the Water Supply (Water Quality) Regulations of 2010 complement the Water Industry Act of 1991 and transpose the Drinking Water Directive into English law. In accordance with the Drinking Water Directive, small water supplies (which serve fewer than 50 persons or supply less than 10m³ per day) are exempt from the requirements. In addition to the requirements of the Drinking Water Directive, binding limits are set for turbidity and eight other indicator parameters as well as for tetrachloromethane. In respect of E.coli and coliform bacteria, there are additional requirements, as there are for ten parameters at the point of supply for consumers (taps).

In 2005, the WHO approach of Water Safety Plans was introduced as a strategic instrument for the development of monitoring the water supply. The Drinking Water Inspectorate stresses the key role

¹⁹¹ German Federal Ministry of Health and German Federal Environment Agency (publisher), Bericht des Bundesministeriums für Gesundheit und des Umweltbundesamtes an die Verbraucherinnen und Verbraucher über die Qualität von Wasser für den menschlichen Gebrauch (Trinkwasser) in Deutschland, reporting period 2008 to 2010, Bonn/Dessau 2011.

¹⁹² DWI Drinking Water Inspectorate, Drinking Water 2012, Public Water Supplies in England, London 2013.

which this concept of preventative risk management plays in the improvement of drinking water quality.¹⁹³

Compliance with statutory quality standards is monitored by the water supply companies themselves. They take a stipulated number of samples at specified intervals and analyse them. The findings are forwarded to the Drinking Water Inspectorate (DWI) and the respective local authorities.

In **France**¹⁹⁴ the Drinking Water Directive was transposed into French law through the Code de la santé publique, Part I, Book III, Title II, Chapter I, in particular articles R. 1321-1 to R. 1321-66 (last modified 2010). An ordinance of January 2007 stipulates quality standards for parameters such as chlorine, lime, lead, nitrate, pesticides and bacteria.

In accordance with the Drinking Water Directive, small water supplies are exempt from the requirements. The legislation in France also goes beyond the requirements of the European Drinking Water Directive. In addition to the parameters laid out in the Drinking Water Directive, additional parameters including barium and microcystin-LR (blue-green algal toxin) were defined. For some parameters (ammonium, pH, TOC, copper and turbidity of the water) stricter limits were defined.

The monitoring of statutory requirements is carried out, independently of the suppliers own monitoring, by the state authorities. Responsibility lies with the Directions départementales des affaires sanitaires et sociales (DDASS).

In the **Netherlands**¹⁹⁵ the European Drinking Water Directive has been transposed through the Drinking Water Act (Drinkwaterwet) of 2011 and the Drinking Water Decree (Drinkwaterbesluit). The objectives of the Dutch government are to achieve a good quality of drinking water, security of supply and affordable prices. In doing so, all water supply entities, irrespective of plant size, are supposed to comply with the same requirements in respect of drinking water quality. Exceptions only apply to a few plants.

In general, stricter requirements apply to the quality of drinking water. Overall, lower maximum limits were set for 15 parameters and six additional national parameters were defined.

The requirements in relation to the measurement of drinking water quality are also strict. The responsibility for the measurement falls firstly to the water supply companies. All companies are obligated under the Drinking Water Act to participate in national benchmarking exercises in which the water quality is regularly presented, as well as in a system for the quantitative microbial risk assessment (QMRA) with which possible risks are identified at an early stage, enabling countermeasures to be taken. The Dutch directive requires monthly monitoring of coliform bacteria and E.coli in abstracted groundwater as well as of E.coli, enterococci and clostridium perfringens in surface water. River water is tested at various monitoring stations with the findings published on the internet.

¹⁹³ DWI, Letter to Parliamentary Under-Secretary for Natural Environment and Fisheries, Annual Report on drinking water quality, London 2011.

¹⁹⁴ France: Ministère de la Santé, de la Jeunesse, des Sports et de la Vie associative (publisher); L'eau potable en France 2005-2006, Paris 2008.

¹⁹⁵ Ministerie von Infrastructuur en Milieu, De kwaliteit van het drinkwater in Nederland, in 2011, Utrecht 2012.

Regional inspectors from the Dutch Ministry of Housing, Spatial Planning and the Environment, which is also responsible for the water supply and public health, monitor the quality measurements and other hygiene aspects. Every extraction of groundwater must be approved by the Dutch provinces.

In **Austria**¹⁹⁶ the transposition of the Drinking Water Directive was accomplished through the Austrian Food Safety and Consumer Protection Act (LMSVG) as well as the ordinances issued on the basis of that law, in particular the ordinance on the Quality of Water for Human Consumption (Drinking Water Ordinance) of 2001, last amended in 2007. The provisions apply for all drinking water facilities, irrespective of their size or water usage. Stricter requirements than are stipulated in the Drinking Water Directive apply in respect of the parameters, nitrite and THMs as well as – for disinfected water – in respect of four additional parameters. Further parameters apply for *P.aeruginosa* at the water tap as well as for temperature.

Compliance with drinking water quality is undertaken in the scope of self-regulation measures (external monitoring). Accordingly, the operators of water supply facilities are obligated to check the water regularly as part of their own responsibilities and to have the facilities monitored. The operator has to make the findings and the reports available to the competent authority in the respective federal state. Monitoring of compliance with the requirements of the Drinking Water Ordinance is undertaken by experts from the food inspection authorities in the federal states. The Austrian Agency for Health and Food Safety (AGES) is also involved in the monitoring process.

In **Poland** in 2001 (thus prior to accession to the EU), the first conditions for the implementation of the European requirements were created in the Act on Implementation of the Environmental Law, in the Water Law and especially in the Act on collective water supply and sewage collection.

For the purpose of the implementation of the Directive 98/83/EC, the Ministry for Health passed the Ordinance on the Quality of Water for Human Consumption in 2010 (Dz. U. 2010 Nr. 72, poz. 466). It regulates the minimum requirements for drinking water supplied to households. The Directive focusses on the quality of drinking water which is supplied via the distribution network and the connections to residential buildings as well as via street outlets and defines processes for the monitoring and supervision of drinking water abstraction and distribution. The ordinance also defines additional chemical parameters beyond those stipulated in the Drinking Water Directive. In addition, since 2002 there has been an ordinance of the Ministry of Environment on the requirements pertaining to drinking water in which the EU standards on water quality have been included. As such, the Polish Water Law has been given extra detail. This ordinance deals with the quality of surface waters and differentiates between three categories of water which are suitable for consumption, depending on the degree of pollution. It prescribes mandatory methods of treatment and purification for each of these categories.

The report for the period 2005 to 2007 was the first national report on drinking water quality following Poland's accession to the EU. As the system of measurement under the Drinking Water Directive was still in the process of being created, until it was finished data for numerous parameters was collected but not in accordance with the system prescribed by the EU (for example, not for all parameters and not nationwide). Consequently, the first report is not comparable with those of other member states. The Drinking Water Directive was implemented in 2010, hence comparable data was provided for the period 2008 to 2010. The competences in Poland are complex. The Chief Sanitary Inspector, an inde-

¹⁹⁶ Federal Ministry of Health, Österreichischer Trinkwasserbericht 2008-2010, Vienna 2013.

pendent role within the Ministry of Health, is responsible for monitoring drinking water quality. The Office for Environmental Protection, the most important body for the implementation of environmental protection rules, carries out measurements in cooperation with the Institute for Meteorology and Water Management and prepares information as to the quality and quantity of water. The Office for State Environment Monitoring also monitors the pollution of surface waters and groundwaters.

Thus, the Drinking Water Directive has been transposed into national law in each of the six countries in the comparison. All quality parameters of the European Drinking Water Directive have been implemented in national regulations; in the process of this implementation, all of the countries have defined stricter limits for individual parameters, which go beyond those set in the European Directive¹⁹⁷.

7.2.2 Meeting the requirements of drinking water quality

By 2012, all member states had sent current data for the period 2008 to 2010 via WISE to the European Commission in the scope of their reporting duties. This data includes, in particular, information on where limits have been exceeded in respect of microbiological, chemical and indicator parameters. They are published via the European Environment Information and Observation Network, Eionet.¹⁹⁸ Based on this data, the European Commission published a summary report.¹⁹⁹

A comparison of the drinking water quality in the six countries in the comparison is made more difficult due to the differing quality of the data. However, in comparison to the period examined in the 2006 VEWA Study, the data available has improved overall. Differences arise in particular in the following issues:

- For all countries, the EU reports on drinking water quality refer to the EU-wide year of data collection of 2010. In addition to that, data is available for the Netherlands from a national report from 2011; in England/Wales, additional data is available for 2012. For France, the last detailed national report covers the years 2005 to 2006; for 2012, a report is almost ready for publication.
- The reporting on drinking water quality is based only on measurements in water supply facilities which serve more than 5,000 persons with drinking water or which supply over 1,000m³ of drinking water into the public supply network. The European minimum standards also apply to the drinking water quality in smaller facilities, only the monitoring provisions differ.²⁰⁰ As some of the smaller facilities deviate substantially from the required standards, the EU wants to use the planned new Annex II to strengthen the efforts to apply the standards also to smaller facilities in future.
- As yet there are no EU-wide requirements as to how often and at which points of supply the samples should be taken. An enforcement of EU-wide requirements was planned in the scope of an amendment to the European Drinking Water Directive but this was not realised. In relation to monitoring, the Commission is therefore currently preparing a so-called "Structured Implementation and Information Framework". The member states currently take different approaches to the

¹⁹⁷ Kiwa Research Institute, Implementation of the Drinking Water Directive 98/83/EC in Europe, June 2005.

¹⁹⁸ Current data can be found at <http://cdr.eionet.europa.eu/>

¹⁹⁹ European Commission, Synthesis Report on the Quality of Drinking Water in the EU examining the Member States' reports for the period 2008-2010 under Directive 98/83/EC; Brussels, 2014.

²⁰⁰ Reports are also available for some countries on this aspect. C.f. DWI, Drinking Water 2010 Private Water Supplies in England, London 2011, and Drinking Water 2010 Private Water Supplies in Wales, London 2011.

regular monitoring process; even within a single member state the methods used in the various supply zones are not always the same, so that the status and availability of monitoring data is not uniform. A comparison of the analysis results between the different countries is therefore only possible to a limited extent. As samples are taken for each water supply company, it is safe to assume that, at least for countries with a large number of companies, the samples broadly cover the supply zones.²⁰¹

- A further aspect which makes the assessment of drinking water quality in the various countries more difficult is that the surveys are purely based on the number of times limits are exceeded. There is no measurement of the extent to which drinking water, which is not within the limits, is impaired.
- Furthermore, the numbers do not allow any conclusions to be drawn as to the volume of water supplied or the number of persons affected as the water supply facilities are not equally sampled under the Drinking Water Ordinance and only the sum of the measurements and the respective results are reported.
- Member states can permit derogations from the stipulated parametric values for a maximum of three years, provided this does not represent a potential danger. The derogations cannot be extended more than twice. The deviations from the limits in the affected areas are not contained in the information on non-compliance with limits.²⁰²

Under the proviso of the aforementioned difficulties, the findings in respect of drinking water quality are presented below. Overall, in the estimation of the Environment Directorate General, the data reported by the member states shows that the drinking water quality in the European Union is generally very good, showing rates of compliance with limits, in particular in respect of the microbiological parameters, between 99% and 100% and that the general trend is very positive. In the case of the smaller water supplies, there is a less than uniform picture; in many countries, they perform much worse, as shown by the following summary graphic.

²⁰¹ For the United Kingdom, for example, clear differences exist between the number of conforming water supply zones and the number of conforming measurements. In the interests of a uniform presentation, in this study the values for the United Kingdom are nevertheless presented on the basis of the number of conforming samples; in the last edition of the study, however, conforming zones were presented.

²⁰² Of the countries in the comparison, the Commission has only granted Germany a third derogation period. For existing water supply facilities, no new derogations are planned on being granted.

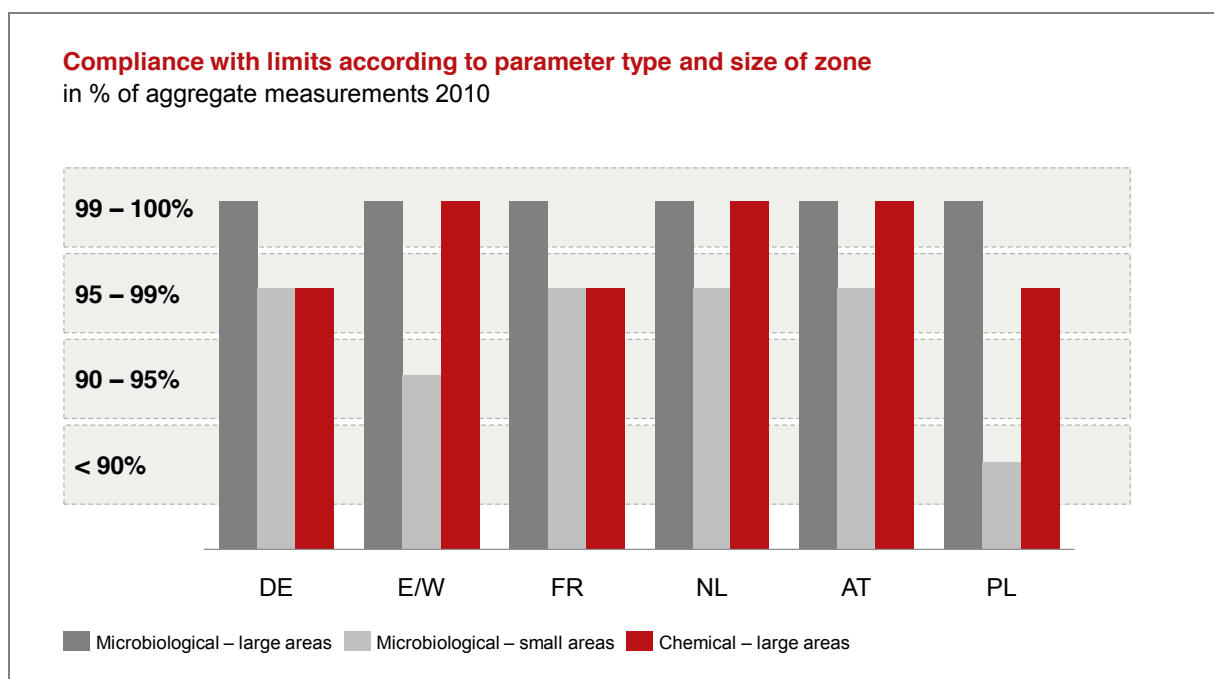


Fig. 78: Compliance with limits according to parameter type and size of zone²⁰³

Drinking water in **Germany** is of a good to very good quality, as the report of the German Federal Ministry of Health and the German Federal Environment Agency explains.²⁰⁴ For almost all of the parameters examined, the few cases where limits have been exceeded amount to a number within the per mil range of all measurements performed. Only for the parameter of coliform bacteria did deviations occur in 0.9% of cases. In this context, however, one should note that in Germany – in contrast to other countries – a purely preventative chlorination is not permitted. For the past problem of nitrate, the measurements confirm that the number of times the limit was exceeded – aside from isolated exceptions – has been substantially reduced in recent years.

In **England/Wales**, the water quality has improved considerably in the twenty years since the Drinking Water Directive came into force, as shown in the 2010 DWI Report.²⁰⁵ According to that report, the limits were complied with in 99.96% of samples in England/Wales, compared with 98.40% in 1990. None of the values reported to the EU exceeded the prescribed limit by 1% or more. The limits were still exceeded, in particular, in respect of the parameters lead, bromate, coliform bacteria, iron and trihalomethanes.²⁰⁶

Alongside the reporting on the public water supply, in England and Wales there are also reports on a total of 62,700 small (so-called private) water supplies which serve private houses, hotels, leisure

²⁰³ European Commission, Synthesis Report on the Quality of Drinking Water in the EU examining the Member States' reports for the period 2008-2010 under Directive 98/83/EC; Brussels, 2014, p. 13.

²⁰⁴ Germany: German Federal Ministry of Health and German Federal Environment Agency (publisher), Bericht des Bundesministeriums für Gesundheit und des Umweltbundesamtes an die Verbraucherinnen und Verbraucher über die Qualität von Wasser für den menschlichen Gebrauch (Trinkwasser) in Deutschland, reporting period 2008 to 2010, Bonn/Dessau 2011.

²⁰⁵ DWI, Drinking Water 2010 Public water supplies in England, London 2011; DWI, Drinking Water 2010 Public water supplies in Wales, London 2011.

²⁰⁶ EIONET, UK Drinking Water Data Return 2008-2010 (revised).

parks etc. The initiative to improve water quality in small water supply zones was started in 2009 and covers measures for the period 2010 to 2015. According to that, around 1.25 million people were supplied with drinking water from small supplies.²⁰⁷ In this context, the limits in England were complied with in 92.5% of samples and in Wales in 93.9% of samples. Limits were exceeded, for example, in the case of E.coli in 13.9% of samples or in the case of nitrate in 11.0% of samples (in 2010 this figure was as high as 46.0%).

In **France** there are larger deviations from the statutory standards. The limits were exceeded in over 1% of cases in 2010 in respect of the parameters lead, fluoride, pesticides, selenium and turbidity as well as nickel and TOC (not presented in the graphic).²⁰⁸

In the **Netherlands**, the quality of the drinking water is very good.²⁰⁹ In the report to the EU for 2010, no parameter is exceeded in more than one percent of measurements. One reason for the good quality is the treatment of the water, such as through membrane technology as well as desalination and disinfection techniques. The parameters are measured in each case at the pumping stations as well as in the supply zones and an annual report is published.

The quality in **Austria** was, aside from a few exceptions, consistently excellent, as the report for the years 2008 to 2010 shows.²¹⁰ In Austria in 2010, around 8.4 million people (67% of the population) were connected to 260 large water supplies. The cases where limits were exceeded related to the (no longer permitted) herbicide atrazine and its metabolite desethylatrazine plus the pesticide bentazone, metolachlor and terbuthylazine as well as the parameters, nitrate and nitrite. For the year 2010, the report lists exceptional permission as having been granted to small supplies which serve fewer than 5,000 residents or which supply less than 1,000 m³ of water.

For **Poland** there are older studies which hint at major problems in the water quality.²¹¹ For example, the quality of the river water improved significantly between 1990 and 2001 but was still at a very low level. According to Polish health standards (as at 2004), the drinking water was considered acceptable, however according to EU standards it was hardly suitable as drinking water in many regions of Poland and in most towns and cities. In 2006, a study concluded that 18.6% of the population connected to the water supply did not receive drinking water of an adequate quality. Due to the bad status of the groundwater at the point of abstraction, especially in rural regions, that water often did not even meet the national health standards for drinking water (32% of public and 45% of individual wells). The main causes were the use of fertilisers in agriculture and the untreated discharge of wastewater. A

²⁰⁷ DWI, Drinking Water 2012 Private water supplies in England, London 2013; DWI, Drinking Water 2012 Private water supplies in Wales, London 2013.

²⁰⁸ EIONET, 2010-02b-templates-WISE-DWD-France-v18; Ministère de la Santé, de la Jeunesse, des Sports et de la Vie associative (publisher.); L'eau potable en France 2005-2006, Paris 2008.

²⁰⁹ Ministerie von Infrastructuur en Milieu, De kwaliteit van het drinkwater in Nederland, in 2011, Utrecht 2012; EIONET, NL_WISE_Rapportage 2010 (not published).

²¹⁰ Federal Ministry of Health, Österreichischer Trinkwasserbericht 2008-2010, Vienna 2013.

²¹¹ C.f. Robin de la Motte, PSIRU, Business School, University of Greenwich: D10i WaterTime National Context Report – Poland, 2005; Inspection for Environmental Protection, The State of environment in Poland 1996-2001, Warsaw 2003.

study in 2006 showed that massive investments were needed in the whole of Poland for the modernisation of the water treatment technology and to improve the water quality of the waterworks.²¹²

Since the accession of Poland to the European Union in 2004, the quality of the water supply has improved substantially, not least because of the extensive investment undertaken. In the synthesis report 2005 – 2007²¹³, however, numerous instances of limits being exceeded were ascertained. In this context, the limits were exceeded for E.coli and mercury in 1.0% of samples, for nitrate in 0.9%, for ammonia in 4.0%, for coliform bacteria in 6.0% and for turbidity in 14.6% of samples. In addition, the report indicated that many parameters are not even monitored and none of the parameters were monitored in all water supply zones. Poland therefore failed to comply with the reporting requirements of the Directive.

For the 2008 – 2010 report, Poland provided values in which there was compliance with the limit for all parameters in over 99.5% of measurements.²¹⁴ To what extent these results will be maintained after a Europe-wide harmonisation of the measurement methods cannot be assessed from the information provided in the report.

Finally, the two graphics below show a comparison of the extent to which limits are exceeded in the six countries in respect of selected microbiological and chemical parameters as well as indicator parameters.

²¹² Österreichische Gesellschaft für Politikberatung und Politikentwicklung (Austrian Association for Political Consultation and Development) ÖGPP (publisher), Privatisierung und Liberalisierung öffentlicher Dienstleistungen in der EU/neue Mitgliedstaaten: Poland, June 2004; GHK (publisher), Strategic Evaluation on Environment and Risk Prevention under Structural and Cohesion Funds for the period 2007-2013, National Evaluation Report for Poland, Executive Summary, Brussels, November 2006.

²¹³ KWR, Synthesis report on the quality of drinking water in the Member States of the European Union in the period 2005-2007 Directive 98/83/EC, 2012.

²¹⁴ EIONET, Poland 98/83/EC Report (2008-2010), <http://cdr.eionet.europa.eu/pl/eu/dwd/>.

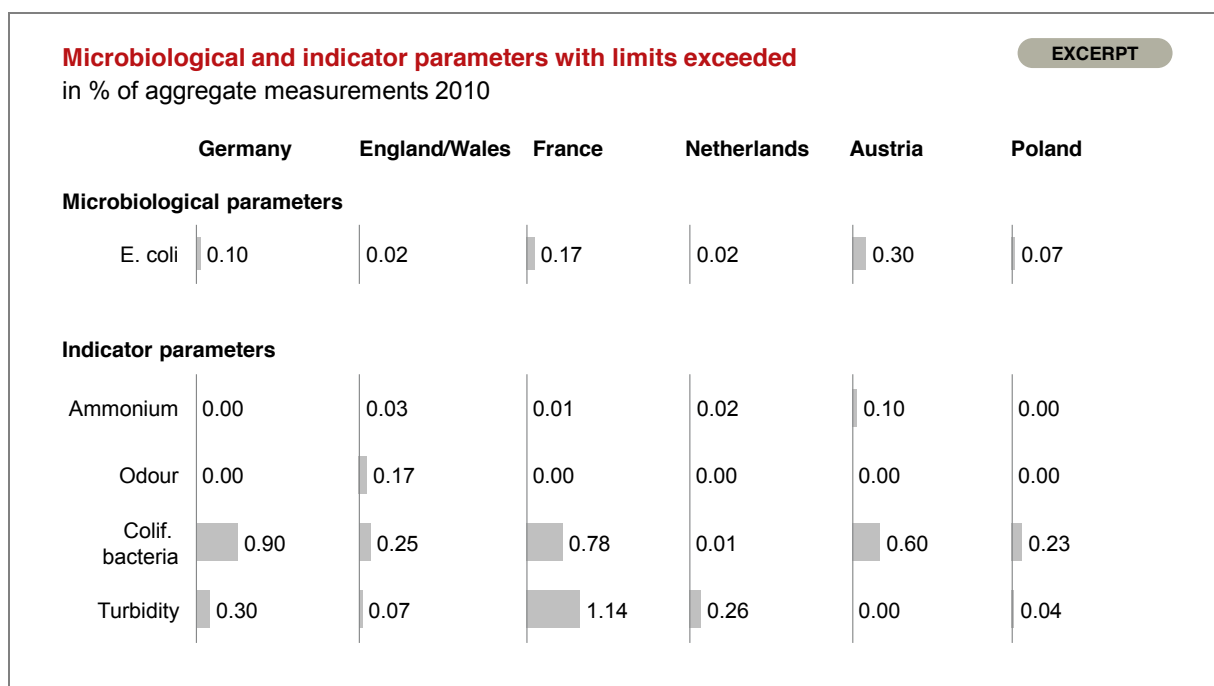


Fig. 79: Microbiological and indicator parameters with limits exceeded²¹⁵

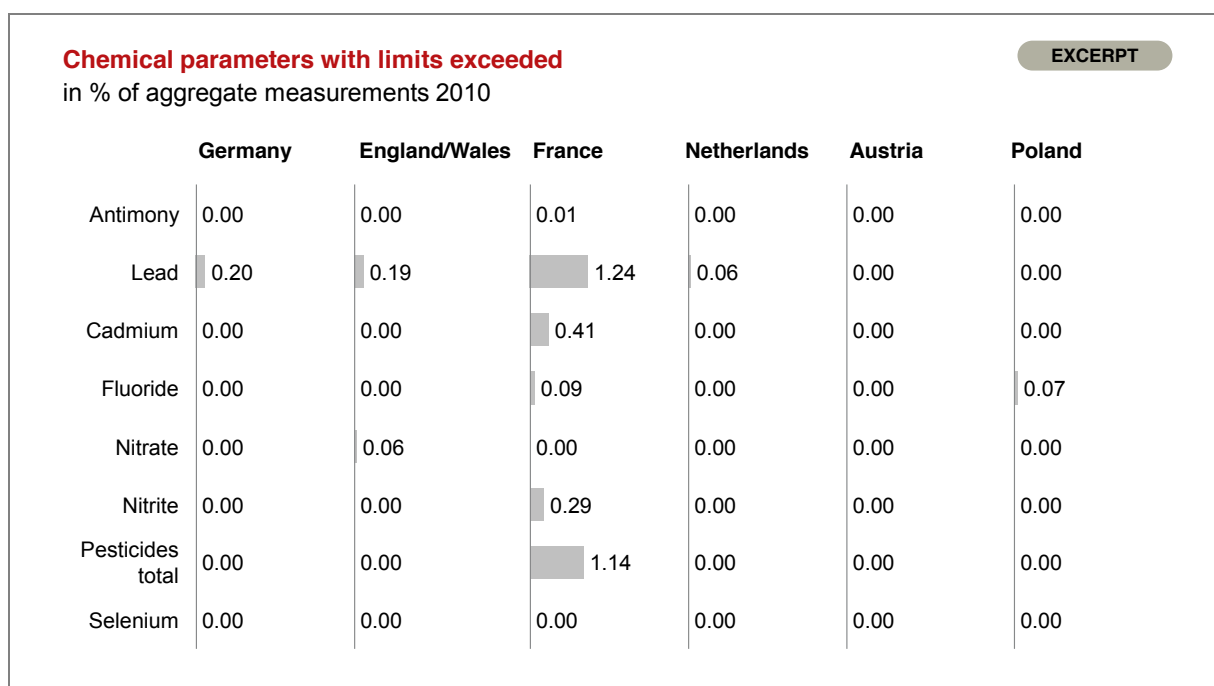


Fig. 80: Chemical parameters with limits exceeded

²¹⁵ For sources, see previous pages.

7.3 Quality of wastewater disposal

The EU Directive concerning urban wastewater treatment (91/271/EEC, amended by Directive 98/15/EC) has set the framework conditions since 1991 for wastewater treatment in the European Union. The objective of the directive is the protection of the environment against impairments from the discharge of urban wastewater. The regulatory framework of the Directive covers the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from particular industries.

The Directive defined urban wastewater as domestic wastewater and a combination of domestic wastewater, industrial wastewater and/or run-off rainwater. The requirements and time limits for the collection and treatment of urban wastewater depend firstly on the population equivalent of the municipalities in which the wastewater is produced and secondly on the waters into which it is discharged. For Poland, which only acceded to the European Union in 2004, different time limits apply than the earlier member states.²¹⁶

The Directive contains the following provisions:

- The member states were obligated to provide collection and treatment systems for urban wastewater for all agglomerations with a p.e. of over 2,000²¹⁷.
- Generally, discharges into sensitive areas must be subject to a secondary treatment²¹⁸.
- For agglomerations with a p.e. of more than 10,000, the Directive stipulates tertiary treatment²¹⁹ or a more stringent treatment according to Article 5. The more stringent treatment is, however, not necessary in areas where it can be shown that the total phosphorus and total nitrogen loads are reduced by at least 75%.
- Agglomerations with over 10,000 residents must also subject the wastewater which they discharge into non-sensitive areas to secondary treatment. For other agglomerations, primary treatment²²⁰ is sufficient for any discharge into coastal waters or river mouths which are designated as less sensitive.
- As far as the disposal of sewage sludge from wastewater treatment plants is concerned, the Directive stipulates that re-use shall have priority. Disposal of sewage sludge into surface waters had to be phased out by the end of 1998.
- The public must be informed by means of a situation report every two years.

²¹⁶ In Poland, in each case until 31 December 2015, via defined intermediate stages; source: Aktualizacja Krajowego programu oczyszczania ścieków komunalnych (AKPOSK) 2009, Warsaw, February 2010.

²¹⁷ A population equivalent is defined as the organic biodegradable load with a biochemical oxygen demand (BOD5) of 60g of oxygen per day.

²¹⁸ Secondary treatment describes the treatment of wastewater with a biological treatment stage with a secondary settlement or equivalent process.

²¹⁹ Tertiary treatment is understood to mean a treatment, in extension of the secondary stage, of nitrogen (nitrification – denitrification), phosphorus and/or other pollutants which impair the quality or a particular use of the water. Art. 5 (3) and (4) as well as Table 2 of Annex I of the EU Wastewater Directive describe the treatment provisions for discharge into sensitive areas and define concentration limits for the parameters.

²²⁰ Primary treatment is understood by the Directive to mean physical/chemical processes to reduce the suspended solids by at least 50% and the BOD5 by at least 20 percent.

The key message of the seventh implementation report of the European Commission²²¹ of August 2013 is that the countries in the comparison have achieved significant improvements in wastewater treatment with the implementation of the European provisions. As a result, the water quality in Europe has improved markedly in recent decades and the effects of pollutants have been reduced. Nevertheless, the implementation has by no means been successfully completed.

The differences in the countries in the comparison are explained below on the basis of the overall load of the wastewater, the designation of sensitive areas and the compliance with the requirements on wastewater collection and wastewater treatment. The report covers all European towns and cities with a population equivalent (p.e.) of over 2,000. The data was valid for 2010.

7.3.1 Proportion of sensitive areas

Discharges into sensitive areas must generally be subject to a secondary treatment. The following areas have been designated as "sensitive":

- Areas which are eutrophic or under threat of eutrophication²²²,
- Areas which contain surface waters intended for the abstraction of drinking water with over 50mg/l nitrate,
- Areas in which wastewater must be subject to more stringent treatment prior to discharge in order to comply with other Council Directives.

For France and Poland, it should be noted that they have many small communities with a p.e. below 2,000, for which the Directive does not have to be applied.

The proportion of areas identified as sensitive had increased by 2010 to 75% of the entire area of the EU. A significant increase was observed in France, among other places.

Germany, the Netherlands, Austria and Poland designated their entire territories as sensitive areas in application of Article 5.8 and 5.4 of the Directive. In contrast, France and Great Britain only designated parts of their territory as sensitive (application of Article 5.1 as well as 5.2 and 5.3 or 5.4 respectively). The following graphic shows the extent to which the countries in the comparison have designated areas as sensitive.

²²¹ European Commission (publisher), 7th Commission Summary on the Implementation of the Urban Waste Water Treatment Directive, Brussels, August 2013 in conjunction with European Commission, Technical assessment of information on the implementation of Council Directive 91/271/EEC, Brussels, December 2012.

²²² Eutrophication is defined as the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.

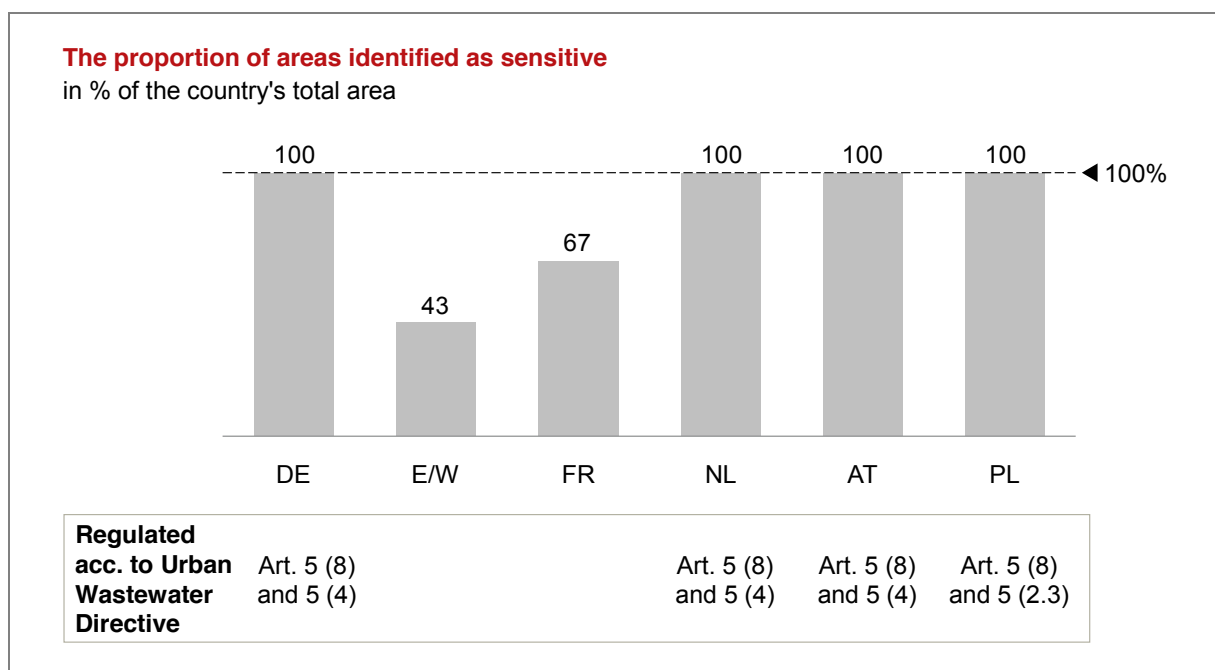


Fig. 81: The proportion of areas designated as sensitive²²³

7.3.2 Compliance with wastewater collection requirements

According to the Urban Waste Water Directive, the member states²²⁴ are obligated to provide all agglomerations with a population equivalent of over 2,000 with collection systems in order to subject the wastewater to treatment. In order to implement these requirements, the Commission records the following results.

²²³ The data for this and the following graphics are taken from the seventh implementation report of the EU Commission.

²²⁴ With the exception of Poland – hereinafter, this fact will not be explicitly referenced at every relevant point.

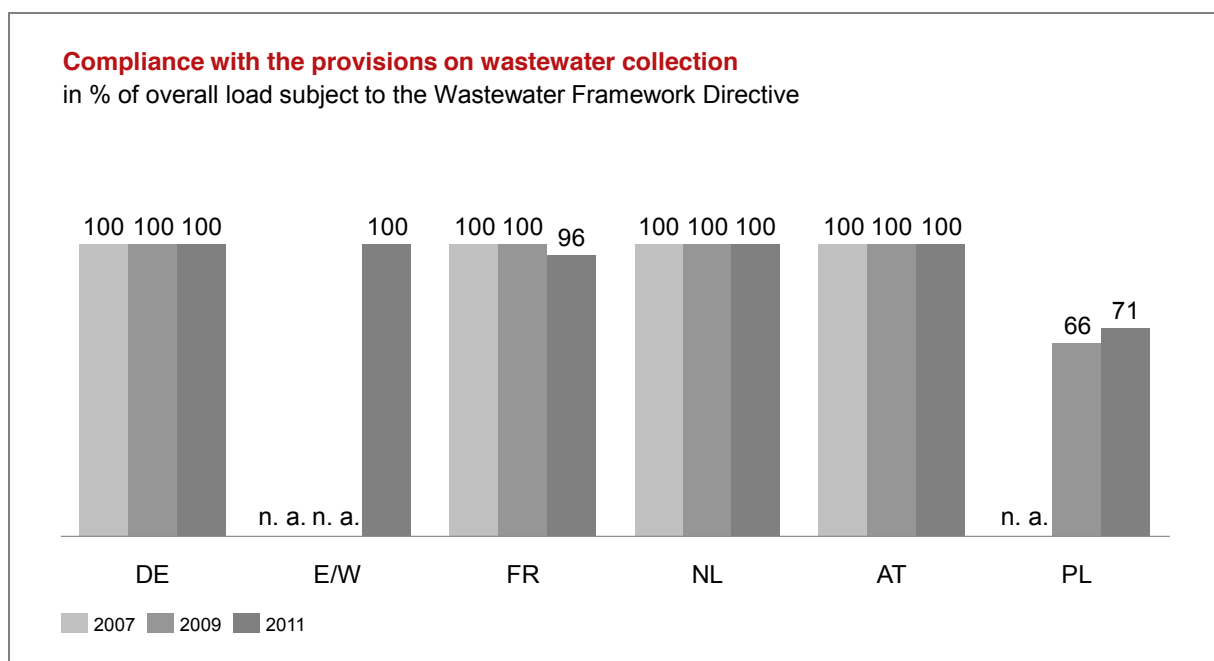


Fig. 82: Compliance with the provisions on wastewater collection

In terms of the overall load, Germany, the United Kingdom, the Netherlands and Austria meet the required standards completely. In Poland, an increasing level of compliance can be observed.

7.3.3 Compliance with wastewater treatment requirements

In respect of the introduction of a secondary treatment stage or equivalent treatment for the urban wastewater entering the collection system, the following picture emerges:

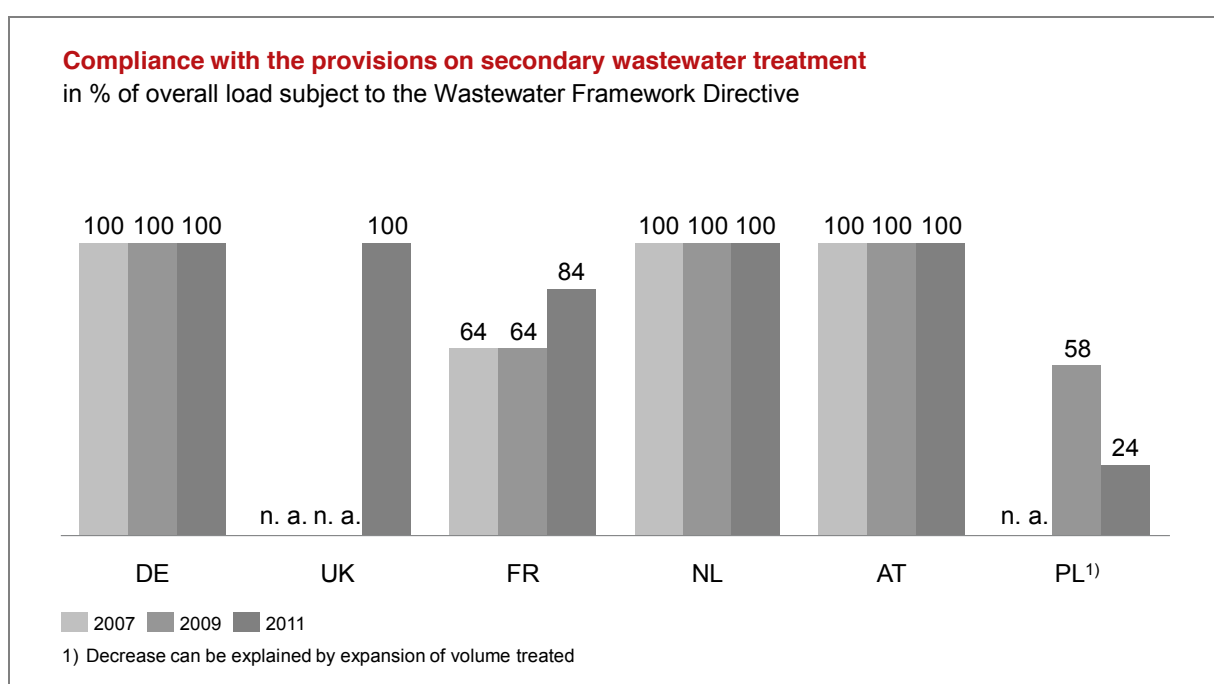


Fig. 83: Compliance with the provisions on secondary wastewater treatment

Germany, the Netherlands and Austria comprehensively meet the requirements. Great Britain and – to an even greater extent – France exhibit deficits in the extent of wastewater treatment. Poland has a later deadline for compliance with the respective provisions and is far from achieving the target values.

The implementation of the provisions on more stringent wastewater treatment is shown in the following graphic. Germany, the Netherlands and Austria comprehensively meet the requirements. In contrast, Great Britain, France and Poland exhibit deficits in the extent of wastewater treatment.

Poland, which is only obligated to comply completely with the Urban Wastewater Directive by 2015, also indicated in a national report as early as 2010 that it would be very difficult to meet the required standards.²²⁵ Delays are regularly encountered in the construction of treatment plants. In an initial intermediate step, the targets established in 2005 were missed by some distance.

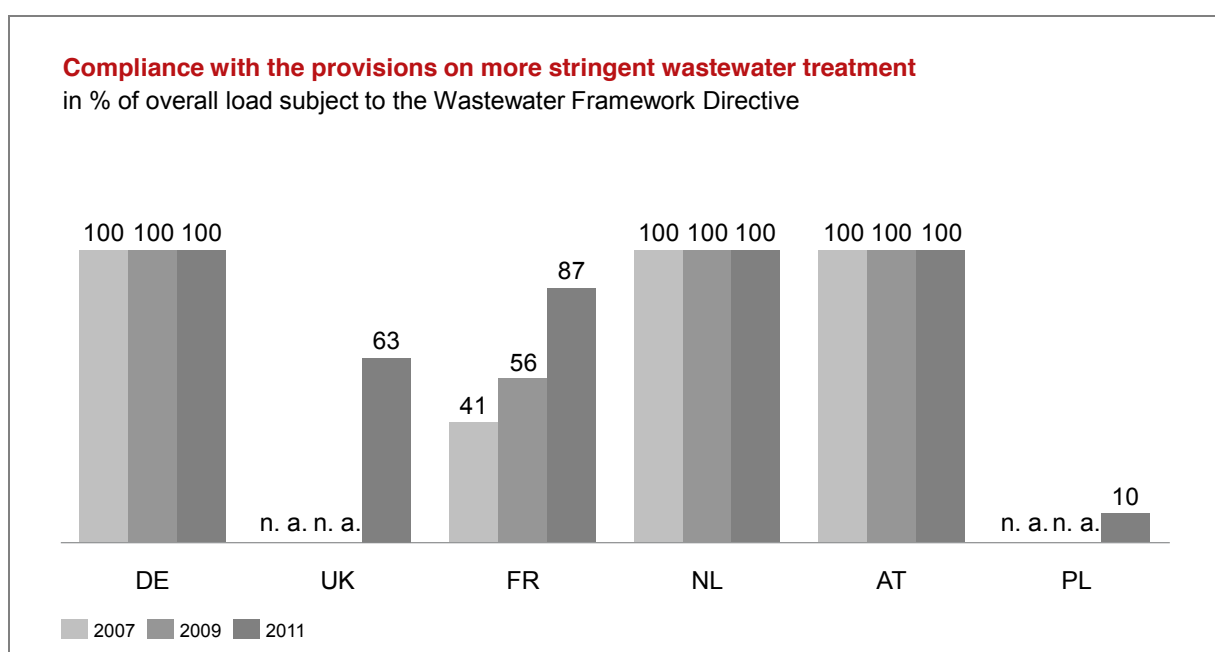


Fig. 84: Compliance with the provisions on more stringent wastewater treatment

In summary, one can conclude that only Germany, the Netherlands and Austria are in complete compliance with the Urban Wastewater Directive in respect of wastewater collection and treatment. In the United Kingdom and in France as well as to a particularly large extent in Poland, there is a need for improvement. This reflects the findings from section 4.1.1 (connection rate and treatment stage).

7.3.4 Compliance with sewage sludge requirements

Under the Urban Wastewater Directive, sewage sludge must be re-used or disposed of according to waste legislation.

In Germany, most sludge overall is produced in urban wastewater treatment plants. Austria has the highest level of sludge produced per connected resident.

²²⁵ Aktualizacja Krajowego programu oczyszczania ścieków komunalnych (AKPOSK) 2009, Warsaw, February 2010.

Sewage sludge production in urban wastewater treatment plants 2010

in kilogrammes per connected resident and in aggregate thousand tons

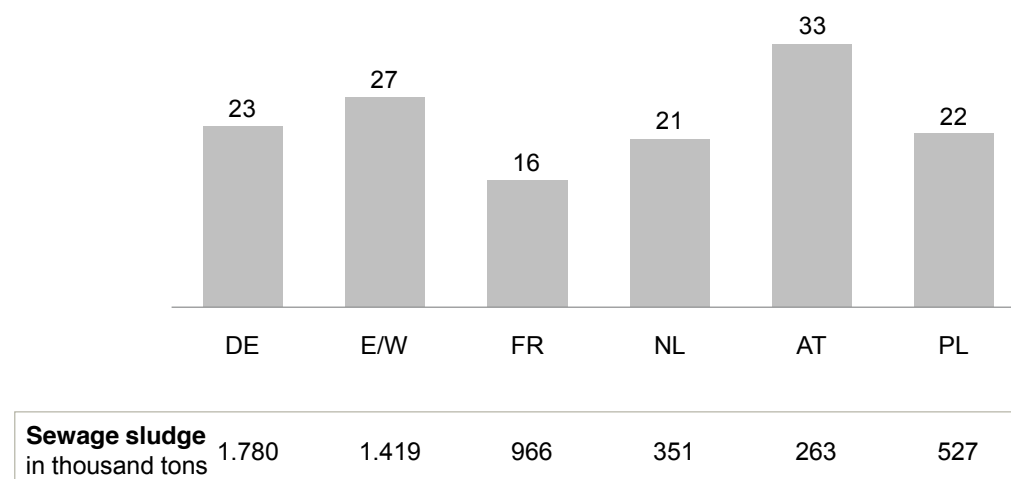


Fig. 85: Sludge production in urban wastewater treatment plants 2010²²⁶

The treatment of sewage sludge in the countries in the comparison is depicted in the following graphic.

Disposal of sewage sludge from urban wastewater treatment plants 2010

in % of total volume 2010

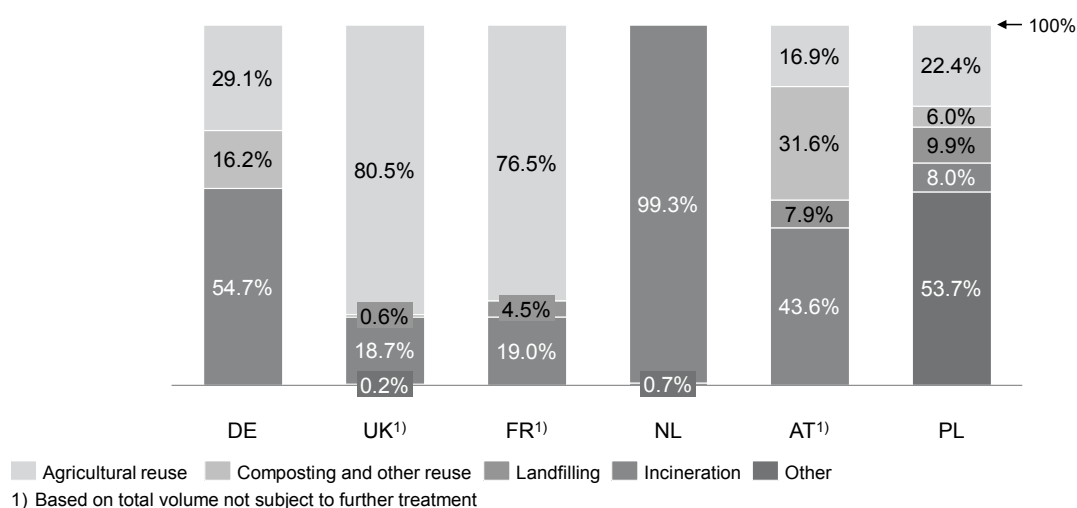


Fig. 86: Disposal of sewage sludge from urban wastewater treatment plants 2010²²⁷

²²⁶ Eurostat database, own calculation.

²²⁷ Eurostat database, own calculation.

7.4 Customer service and customer satisfaction

The image of water supply and wastewater disposal companies in public and the satisfaction of customers are of increasing importance for the companies and the relevant public bodies. Customer surveys play an important role in this area.

In the countries in the comparison, there are numerous studies on the topic of customer satisfaction. In **Germany**, for example, BDEW regularly commissions analyses of the satisfaction of customers which are published under the title "Customer barometer for water and wastewater".²²⁸ The customer barometer is based on a telephone survey of households on the relevant aspects of water supply in Germany.

In **England/Wales** the regional customer service committees of the water industry (CSC) are responsible for informing the regulatory authority, OFWAT, annually as to the status of and changes in customer satisfaction. The satisfaction of customers is analysed, for example, using customer enquiries regarding bills and written complaints as well as on how easily the companies could be reached by telephone. The results are published by OFWAT in their report entitled "Levels of service for the water industry in England and Wales".²²⁹

In **France** the Centre d'information sur l'eau conducts surveys on customer satisfaction and integrates surveys from different towns and cities. In addition, the opinion research institute, SOFRES, documents regular surveys of consumers regarding water supply and wastewater disposal.

In the **Netherlands** surveys on customer satisfaction and other qualitative factors are conducted every three years in the scope of the regular benchmarking exercise of the national water suppliers under the coordination of the association, VEWIN.²³⁰

In **Austria**, the "AQA Water Report" is regularly produced by a market research institute in cooperation with the Austrian Association for Gas and Water, on the basis of interviews. These interviews also contain questions on the topic of customer service.²³¹

In **Poland** there are currently no known comparable surveys conducted.

7.4.1 Attitudes to water issues

The European Commission published a Eurobarometer in 2012 which examined attitudes to water related issues. The survey examined how well-informed Europeans felt they were about problems and what measures and solutions they considered appropriate.²³²

Selected key findings were:

²²⁸ BDEW, Kundenbarometer Wasserversorgung und Abwasserentsorgung, 2013. See also ATT, BDEW, DBWW, DVGW, DWA, VKU (publisher), Branchenbild der deutschen Wasserwirtschaft 2011.

²²⁹ OFWAT, Levels of service for the water industry in England/Wales, 2006-07 report.

²³⁰ VEWIN/accenture (publisher), Reflections on performance 2012.

²³¹ AQA GmbH, AQA Wasserreport 2014.

²³² European Commission, Directorate-General for Environment, Flash Eurobarometer 344, "Attitudes of Europeans towards water – related issues", May 2012.

- Europeans feel less informed about problems facing groundwater and surface waters than they did in 2009.

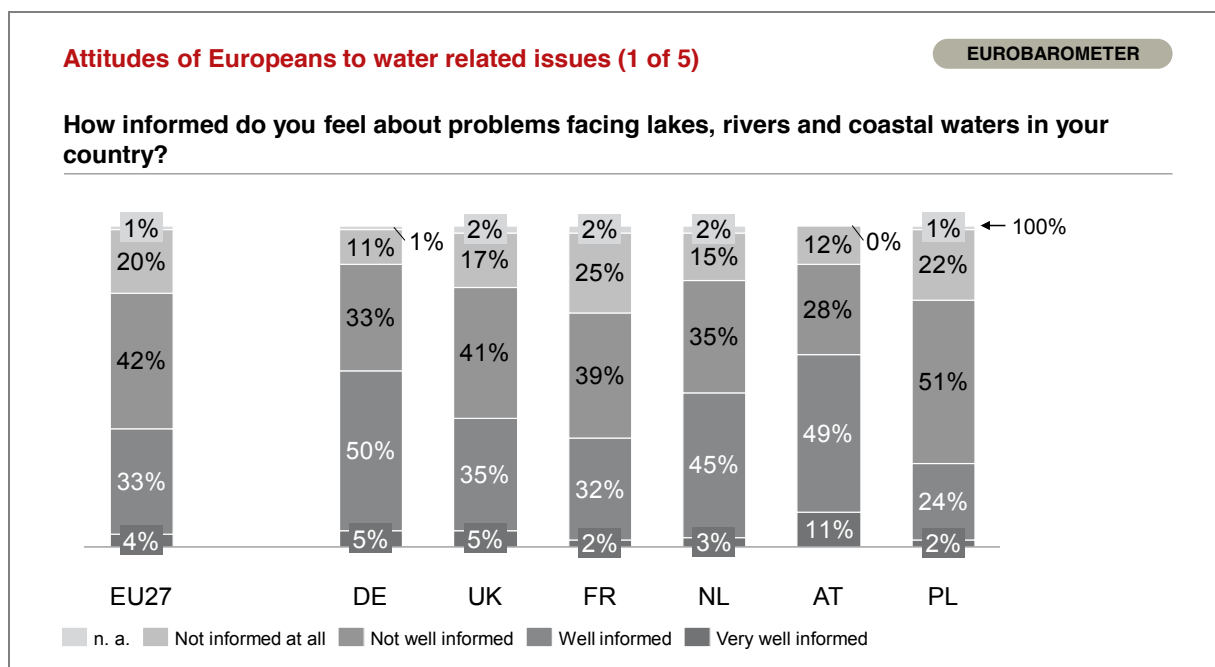


Fig. 87: Attitudes of Europeans to water related issues (1 of 5)²³³

- The majority believes the water quality and quantity problems are serious.

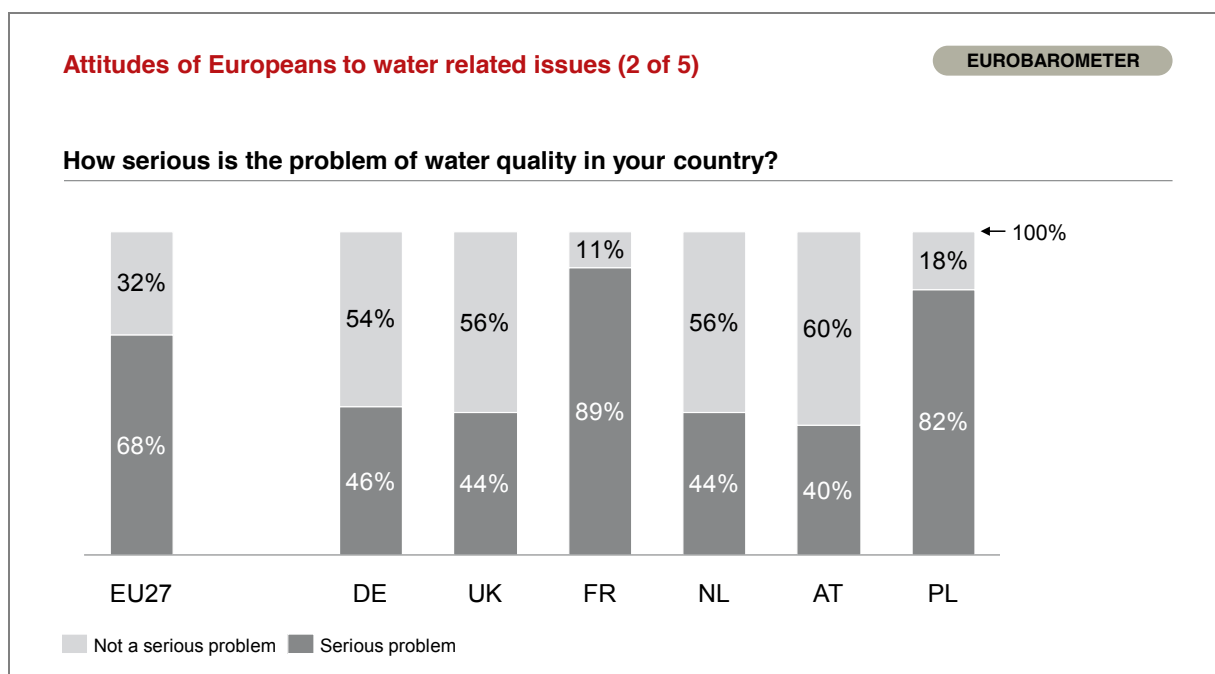


Fig. 88: Attitudes of Europeans to water related issues (2 of 5)

²³³ This and the following graphics are taken from Eurobarometer 344.

- Less than half of Europeans think that the quality of waters has improved in the past ten years.

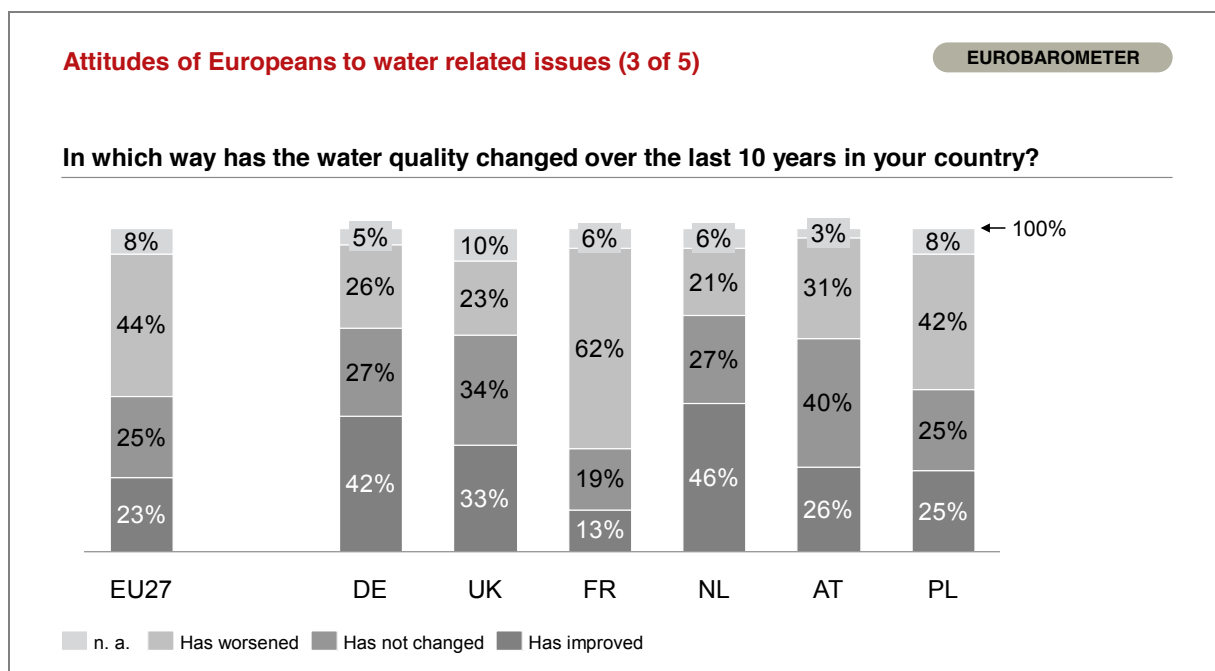


Fig. 89: Attitudes of Europeans to water related issues (3 of 5)

- Europeans believe that chemical pollution is the main threat to the water environment.
- Most Europeans are in favour of a user-pays system for financing water and – to a lesser extent – that the costs should reflect the environmental impact of water use.

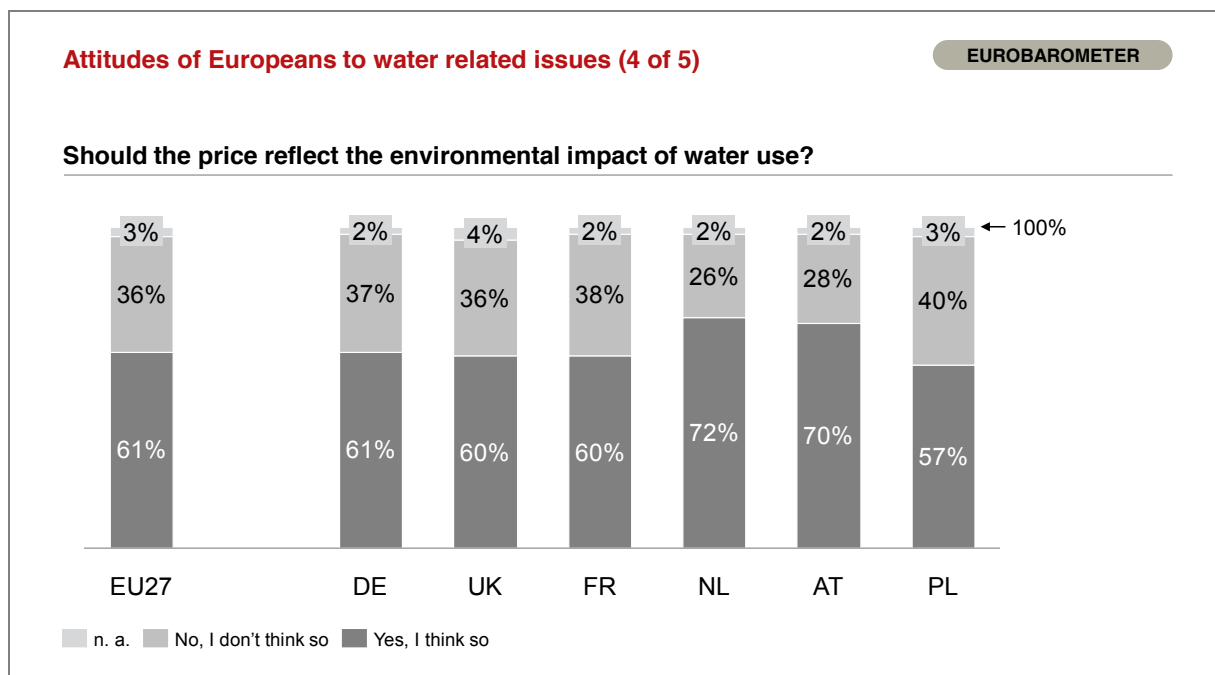


Fig. 90: Attitudes of Europeans to water related issues (4 of 5)

- Around half of Europeans drink tap water; the proportion differs widely depending on the country.

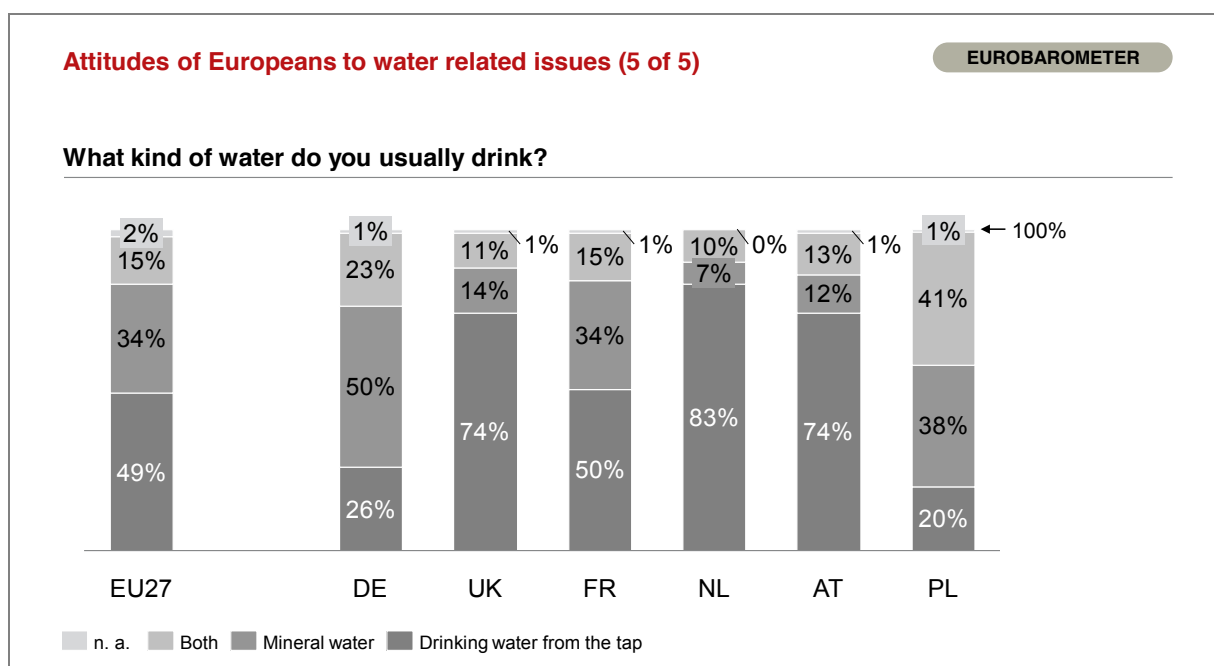


Fig. 91: Attitudes of Europeans to water related issues (5 of 5)

7.4.2 Customer satisfaction

As it is difficult to compare the national surveys with one another, this study only presents in detail the findings of a survey of the European Commission on the topic of customer satisfaction. In 2006, the Institutes of TNS Opinion & Social Network²³⁴ conducted – at the request of the European Commission, Directorate General for Health and Consumers and coordinated by the Directorate General Communication – a survey on services of general interest amongst European users of such services.²³⁵ Questions were asked about access to the various services, prices, quality, information for consumers, complaints and customer service. The following graphics show in detail for each of the above issues the findings for all EU states in aggregated form and the findings of the survey for all six of the countries examined in this study.

In this context, it should be noted that the Europe-wide survey this was based on does not aim to ascertain the objective status of water management but the subjective opinion of the citizens. Therefore, the informative value is limited.

On the issue of satisfaction with the **price of the services** in the area of water supply, Austria scored much higher than the other countries in the comparison. 94% of respondents believed that the price was reasonable. The figures for the Netherlands and Great Britain were also above the European average of 75%. In contrast, France and Poland were considerably lower than the EU average. In Po-

²³⁴ In Germany, for example, TNS Infratest

²³⁵ European Commission, Directorate General for Health and Consumers, Special Eurobarometer 260 "Services of General Interest", July 2007.

land, water and wastewater prices have increased relatively sharply in recent years; further, disproportionate rises are expected in the next few years.

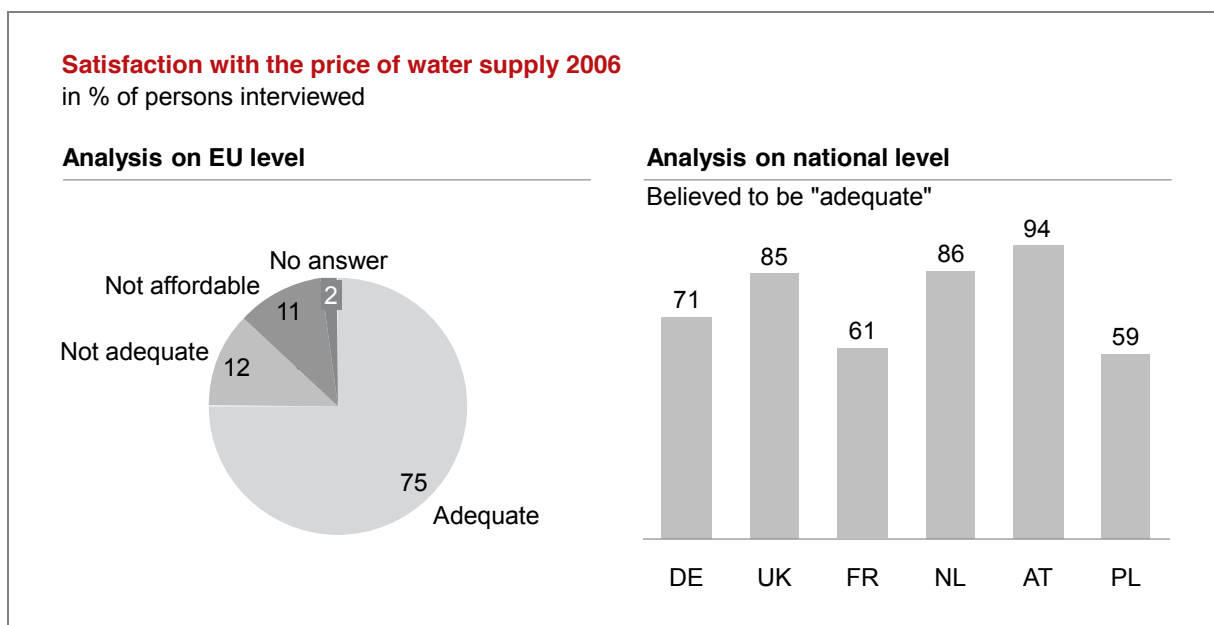


Fig. 92: Satisfaction with the price of water supply 2006²³⁶

Satisfaction with the **customer service of water suppliers** (Fig. 93) was ascertained through how complaints are dealt with. The percentage of citizens satisfied with this aspect of customer service is highest in Poland and lowest in Germany and the Netherlands.

In the case of **consumer protection in water supply** (Fig. 94), Germany receives the lowest rating of the six countries in the comparison. Consumers in Austria, Great Britain and the Netherlands exhibit an above average level of satisfaction.

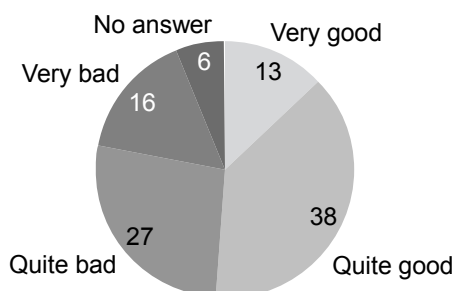
According to the three indicators presented, the citizens in Austria are on average the most satisfied with the water supply in their country.

²³⁶ European Commission, Directorate General for Health and Consumers, Special Eurobarometer 260 "Services of General Interest", July 2007.

Satisfaction with the customer service of the water supply 2006

in % of persons interviewed

Analysis on EU level



Analysis on national level

Believed to be "very good" or "quite good"

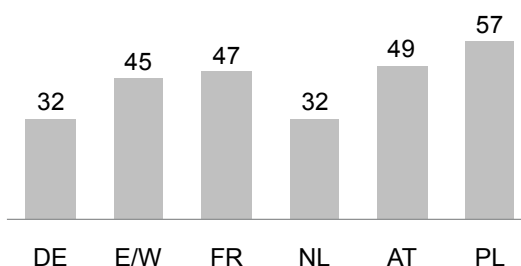
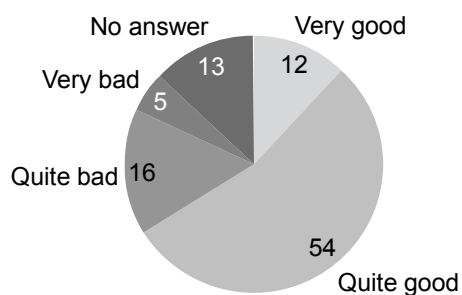


Fig. 93: Satisfaction with the customer service of the water supply 2006

Satisfaction with consumer protection in relation to water supply 2006

in % of persons interviewed

Analysis on EU level



Analysis on national level

Believed to be "very good" or "quite good"

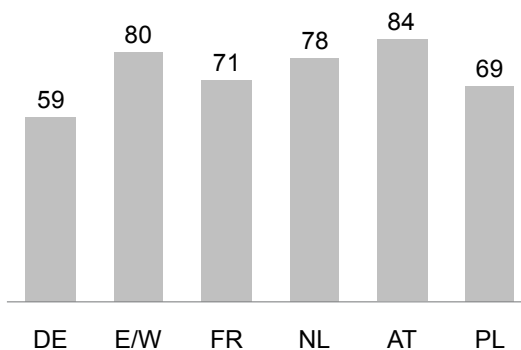


Fig. 94: Satisfaction with consumer protection in relation to water supply 2006

Conversation partners

In the scope of the preparation of the first report in 2006 and the two updates in 2010 and 2014, a series of conversations were held with experts, who we would like to thank for their constructive assistance and willingness to participate.

Wulf Abke	Hessenwasser GmbH & Co. KG, Frankfurt/Main
Martin Ast	Niedersächsisches Umweltministerium, Hanover
Kees Baas	CBS Centraal Bureau voor de Statistiek, Den Haag
Dr. Oskar Beck	Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz, Munich
Jens Becker	Niedersächsisches Umweltministerium, Hanover
Klaus Berghausen	EWV Energie- und Wasser-Versorgung GmbH, Stolberg
Horst Bittelmeyer	Ministerium für Umwelt Saarland, Saarbrücken
Walter Blank	Umweltministerium Baden-Württemberg, Stuttgart
Detlev Block	Senat für Umwelt, Bau, Verkehr und Europa, Bremen
Mateusz Bogdanowicz	Izba Gospodarcza Wodociągi Polskie, Bydgoszcz (Poland)
Lothar Cattarius	Ministerium für Umwelt und Forsten Rheinland-Pfalz, Mainz
Peter Dane	VEWIN Vereniging van waterbedrijven in Nederland, Rijswijk (Netherlands)
Andrea Danowski	BDEW Bundesverband der Energie- und Wasserwirtschaft, Berlin
Andrew Day	OFWAT Office of Water Services in England and Wales, Birmingham
Gert Dekker	VNG Vereniging van Nederlandse Gemeenten, Den Haag
Wijnand Dekking	Unie van Waterschappen (Association of Regional Water Authorities), Den Haag
Adriana Dembowska	Krajowy Zarząd Gospodarki Wodnej (National Water Management Authority), Warsaw
Ilka Dettbarn	Innenministerium des Landes Schleswig-Holstein, Kiel
Harald Dik	Rijksinstituut voor Volksgezondheid en Milieu, Bilthoven
Karolina Duleba	Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej, Warsaw
Mustafa Dönmez	Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz, Wiesbaden
Günter Eckert	Staatsministerium für Umwelt und Landwirtschaft Sachsen, Dresden
Manfred Eisenhut	ÖVGW Österreichische Vereinigung für das Gas- und Wasserfach, Vienna

Dr. Thomas Ertl	Universität für Bodenkultur Wien, Vienna
Hans-Peter Ewens	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Bonn
Jean Antoine Faby	OIEau Office International de l'Eau, Orléans
Sebastian Freier	Thüga Aktiengesellschaft, Munich
Rainer Fuchs	Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz Hessen, Wiesbaden
Bernd Funke	Gelsenwasser AG, Gelsenkirchen
Ludwig Gaßner	Bayerisches Staatsministerium für Umwelt und Gesundheit, Munich
Peter Geudens	VEWIN Vereniging van waterbedrijven in Nederland (Verband der Wasserversorgungsunternehmen in den Niederlanden), Rijswijk (Niederlande)
Jakub Gibek	Krajowy Zarząd Gospodarki Wodnej (National Water Management Authority), Warsaw
Andreas Gockeln	RWW Rheinisch-Westfälische Wasserwerksgesellschaft mbH, Mülheim an der Ruhr
Thomas Grabowski	Ministerstwo Środowiska (Umweltministerium Polen), Warsaw
Patrice Gregoire	IFEN Institut Français de l'Environnement, Orléans
Mark Hann	OFWAT Office of Water Services in England and Wales, Birmingham
Kate Haycock	OFWAT Office of Water Services in England and Wales, Birmingham
Birgit Hein	Statistisches Bundesamt, Wiesbaden
Dr. Jürgen Heidborn	Bundesministerium für Bildung und Forschung, Bonn
Thomas Herkner	BDEW Bundesverband der Energie- und Wasserwirtschaft, Berlin
Corine Hoeben	COELO, Institut of the University of Groningen (Netherlands)
Anke van Houten	Unie van Waterschappen (Association of Regional Water Authorities), Den Haag
Andreas Hölzer	Behörde für Stadtentwicklung und Umwelt, Hamburg
Reinhold Hüls	Veolia Water Deutschland GmbH, Berlin
Mike Jarema	OFWAT Office of Water Services in England and Wales, Birmingham
Meike Johansen	BSU Behörde für Stadtentwicklung und Umwelt, Hamburg
Frank Jungfermann	BWB Berliner Wasserbetriebe, Berlin
Dr. Hans-J. Kampe	BMWA Bundesministerium für Wirtschaft und Arbeit, Berlin
Daniel Karcher	Eurawasser Aufbereitungs- und Entsorgungs GmbH, Berlin
Iwona Kasperczyk	PWiK sp. z o.o. Dąbrowa Górnicza, Poland
Remigiusz Klich	Izba Gospodarcza Wodociągi Polskie, Bydgoszcz (Poland)

Udo Kloppmann	Umweltministerium Mecklenburg-Vorpommern, Schwerin
Werner Knaus	Bayerische Rieswasserversorgung (BRW), Nördlingen
Martina Koch	BDEW Bundesverband der Energie- und Wasserwirtschaft, Berlin
Michael Koch	Senat für Umwelt, Bau und Verkehr, Bremen
Katja Kohlhasse	Ministerium für Landwirtschaft, Umwelt und ländliche Räume Schleswig-Holstein, Kiel
Bianca Kranz	Niedersächsisches Ministerium für Umwelt und Klimaschutz, Hanover
Alfons Kreutzer	Ministerium für Umwelt Saarland, Saarbrücken
Peter Kristensen	EEA European Topic Centre on Water
Marta Kukulska	Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej, Warsaw
Dr. Johannes Laber	Kommunalkredit Public Consulting GmbH, Vienna
Paul Langeveld	Unie van Waterschappen (Association of Regional Water Authorities), Den Haag
Mag. Franz Lehner	ÖWAV Österreichischer Wasser- und Abfallwirtschaftsverband, Vienna
Dr. Katharina Lenz	Umweltbundesamt GmbH, Vienna
Günther Leymann	Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz Mecklenburg-Vorpommern, Schwerin
Sven Liekfeldt	Ministerium für Wirtschaft Brandenburg, Potsdam
Jürgen Lönz	Bayerisches Staatsministerium für Umwelt und Verbraucherschutz
Céline Magnier	Ministère de l'Ecologie, du Développement durable et de l'Energie, department for statistics, Orléans
Christof Mainz	Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz des Landes Nordrhein-Westfalen, Düsseldorf
Dr. Birgit Mendel	Bundesministerium für Gesundheit, Bonn
Dr. Wolf Merkel	IWW Rheinisch-Westfälisches Institut für Wasserforschung Gemeinnützige GmbH, Mülheim an der Ruhr
Barbara Michalska	Ministerstwo Infrastruktury (Ministry of Infrastructure, Poland)
Régis Morvan	IFEN Institut Français de l'Environnement, Orléans
Hans Mudlamootoo	Department for Environment, Food and Rural Affairs, London
Dr. Peter Nisipeanu	Ruhrverband, Essen
Gerhard Odenkirchen	Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz des Landes Nordrhein-Westfalen, Düsseldorf
Thorsten Ohl	Statistisches Bundesamt, Wiesbaden
Anna Olkiewicz	Izba Gospodarcza Wodociągi, Bydgoszcz (Poland)

Dr. Eric Oosterom	RIONED Foundation, Ede (Netherlands)
Anja Panko	Izba Gospodarcza Wodociągi, Bydgoszcz (Poland)
Juliaan Prast	Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, Den Haag
Dr. Arnold Quadflieg	Hessisches Ministerium für Umwelt, Energie, Landwirtschaft und Verbraucherschutz, Wiesbaden
Dr. Silvia Rabolt	Ministerium für ländliche Entwicklung, Umwelt- und Verbraucherschutz Brandenburg, Potsdam
Dr. Jörg Rehberg	BDEW Bundesverband der Energie- und Wasserwirtschaft, Berlin
Dr. Joachim Reichert	Niersverband, Viersen
Eric Requis	Ernst & Young – Environnement et Développement Durable, Neuilly sur Seine
Jean-Pierre Rideau	Ministère de l'Ecologie et du Développement Durable, Paris
Kevin Ridout	OFWAT Office of Water Services in England and Wales, Birmingham
Andreas Riha	ÖVGW Österreichische Vereinigung für das Gas- und Wasserfach, Vienna
Alban Roben	Ministre des Solidarités, de la Santé et de la Famille, Paris
Heiner Schmallenbach	Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft, Bonn
Andreas Schmitz	BWB Berliner Wasserbetriebe, Berlin
Winfried Schreiber	Ministerium für Umwelt, Forsten und Verbraucherschutz, Rheinland-Pfalz
Kathrin Schröck	Landesinvestitionsbank Brandenburg, Potsdam
Thomas Schwarz	Münchner Stadtentwässerung
Walter Schwingel	Stadtwerke Saarbrücken AG
Olaf Seefeldt	Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz, Mecklenburg-Vorpommern
Peter Stiens	Hessenwasser GmbH & Co. KG, Groß-Gerau
Thomas Stratenwerth	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Bonn und Berlin
Vera Szymansky	BDEW Bundesverband der Energie- und Wasserwirtschaft, Berlin
Dr. Hellmut Thiem	Stadtwerke Hannover AG
Theo Thissen	Kreiswerke Grevenbroich GmbH, Grevenbroich
Aurelie Thouet	Ministère de la Santé, de la Jeunesse, des Sports et de la Vie associative, Paris
Dr. Dieter Vesper	DIW Deutsches Institut für Wirtschaftsforschung

Niels Vlaanderen	Ministerie van Verkeer en Waterstaat, Den Haag
Diana Voigt	Investitionsbank des Landes Brandenburg
Thomas Wagner	Thüringer Ministerium für Landwirtschaft, Naturschutz und Umwelt, Erfurt
Edyta Walicka	Central Statistical Office of Poland (GUS), Warsaw
Martine Wichmann	IFEN Institut Français de l'Environnement, Orléans
Michael Willms	DWA Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V., Hennef
Cornelia Witschel	Sächsisches Staatsministerium für Umwelt und Landwirtschaft, Dresden
Paulina Wrzosek	Central Statistical Office of Poland (GUS), Warsaw
Ulrike Ziegler	Ministerium für Landwirtschaft und Umwelt Sachsen-Anhalt, Magdeburg
Christin Zimmer	Ministerium für Landwirtschaft und Umwelt Sachsen-Anhalt, Magdeburg

List of Abbreviations

AGES	Österreichische Agentur für Gesundheit und Ernährungssicherheit
ATV-DVWK	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (now DWA)
BB	German state of Brandenburg
BE	German state of Berlin
BDEW	Bundesverband der Energie- und Wasserwirtschaft (formerly BGW)
BGW	Bundesverband der deutschen Gas- und Wasserwirtschaft (now BDEW)
GDP	Gross Domestic Product
BMLFUW	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Austria
BMU	Bundesministerium für Umwelt, Germany
BMWi	Bundesministerium für Wirtschaft und Technologie, Germany
BW	German state of Baden-Württemberg
BY	German freestate of Bavaria
CBS	Centraal Bureau voor de Statistiek, Netherlands
CFC	Consommation de capital fixe
CIEA	Centre international d'études agricoles
CSO	Central Statistical Office, Poland
DE	Germany
DDAF	Directions départementales de l'agriculture et de la forêt
DDASS	Directions départementales de l'action sanitaire et sociale
DDE	Directions départementales de l'équipement
DEFRA	Department for Environment, Food and Rural Affairs, London
Difu	Deutsche Institut für Urbanistik
DRIRE	Directions régionales de l'industrie et de la recherche
DWA	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (formerly ATV-DVWK)
DWI	Drinking Water Inspectorate
EA	Environmental Agency
EAGFL	European Agricultural Guarantee Fund
EEA	European Environment Agency

EFRE	European Regional Development Fund
EIONET	European Environment Information and Observation Network
EU	European Union
EUREAU	European Federation of National Associations of Drinking Water Supplies and Waste Water Services
Eurostat	Statistical office of the European Union
E/W	England/Wales
EWG	European Economic Community
FNDAE	Fonds national pour le développement des adductions d'eau
FP2E	Fédération professionnelle des entreprises de l'eau
FR	France
GAK	Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes
GUS	Główny Urząd Statystyczny (Statistical Office Poland)
HB	German state of Bremen
HE	German state of Hesse
HH	German state of Hamburg
HICP	Harmonised Index of Consumer Prices
IFEN	Institut français de l'environnement
IGWP	Izba Gospodarcza Wodociągi Polskie, Poland
INSEE	Institut national de la statistique et des études économiques
KFA	Kommunaler Finanzausgleich
KfW	Kreditanstalt für Wiederaufbau
KPC	Kommunalkredit Public Consulting GmbH
KZGW	Krajowy Zarząd Gospodarki Wodnej (National Water Management Authority), Poland
LAWA	Länderarbeitsgemeinschaft Wasser
LMSVG	Lebensmittelsicherheits- und Verbraucherschutzgesetz
MISE	Mission interservice de l'eau
MV	German state of Mecklenburg-West Pomerania
NI	German state of Lower Saxony
NL	The Netherlands
NRA	National Rivers Authority

NW	German state of North Rhine Westphalia
AT	Austria
OECD	Organisation for Economic Co-operation and Development
OFWAT	Office of Water Services
OIEau	Office International de l'eau
ONS	Office for National Statistics
ÖVGW	Österreichische Vereinigung für das Gas- und Wasserfach
ÖWAV	Österreichischer Wasser- und Abfallwirtschaftsverband
PAK	Polycyclic aromatic hydrocarbon
p.e.	Population equivalent
PL	Poland
PVC	Polyvinyl chloride
QRMA	Quantitative microbiological risk assessment
Rioned	Stichting Rioned
RP	German state of Rhineland Palatinate
SEDIF	Syndicat des Eaux d'Ile-de-France
SH	German state of Schleswig-Holstein
SL	Saarland
SN	German state of Freistaat Saxony
ST	German state of Saxony Anhalt
TH	German state of Freistaat Thuringia
UK	United Kingdom
UVW	Unie van Waterschappen
VEWIN	Vereniging van waterbedrijven in Nederland, Den Haag
VNF	Voies navigables de France
VROM	Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, Netherlands
WFD	Water Framework Directive
WISE	Water Information System for Europe

Bibliography

Related to more than one country

Ecologic, im Auftrag des Umweltbundesamts, Vergleich der Trinkwasserpreise im europäischen Rahmen, Berlin 1998

EIONET Datenbank (<http://cdr.eionet.europa.eu>)

EUREAU, Statistic Overview on Water and Wastewater in Europe 2008, Brussels 2009

European Commission, Directorate-General for Environment, Attitudes of Europeans towards water – related issues, Report, Flash Eurobarometer 344, Brussels 2012

European Commission, Bericht der Kommission an das Europäische Parlament und den Rat gemäß Artikel 18 Absatz 3 der Richtlinie 2000/60/EG (Wasserrahmenrichtlinie) über Programme zur Überwachung des Zustands der Gewässer, KOM(2009) 156 endgültig, Brüssel, 2009 und 2012

European Commission, Bericht der Kommission gemäß Art. 3 Abs. 7 der Grundwasserrichtlinie 2006/118/EG über die Festlegung von Schwellenwerten für Grundwasser, K (2010) 1096 endgültig, Brüssel 2010

European Commission, Bericht über die Durchführung der Richtlinie des Rates 91/271/EWG vom 21. Mai 1991 über die Behandlung von kommunalem Abwasser, geändert durch die Richtlinie der Kommission 98/15/EG vom 27. Februar 1998, Brüssel 2004, 2009 und 2013

European Commission, Explanatory note to the draft Commission Directive amending Annex II to Directive 2006/118/EC on the protection of groundwater against pollution and deterioration, Brüssel 2014

European Commission, Generaldirektion Umwelt und Verbraucherschutz, Special Eurobarometer 219 und 260, 2005 und 2007

European Commission, Mitteilung der Kommission an das Europäische Parlament und den Rat: Nachhaltige Wasserbewirtschaftung in der Europäischen Union – Erste Stufe der Umsetzung der Wasserrahmenrichtlinie 2000/60/EG, KOM(2007) 128 endgültig, Brüssel, 22.3.2007

European Commission, Pressemitteilung: Umwelt: Kommission verklagt Polen in Zusammenhang mit Wasserschutzvorschriften, Brüssel, 21.02.2013

European Commission, Synthesebericht zur Qualität des Trinkwassers in der EU auf der Grundlage der Prüfung der Berichte der Mitgliedsstaaten für den Zeitraum 2008 – 2013 gemäß der Richtlinie 98/83/EC, Brüssel 2014

European Commission, Umwelt-Webseite: http://ec.europa.eu/environment/index_en.htm

European Commission, VAT Rates Applied in the Member States of the European Union, 2014

European Environment Agency (Ed.), Assessment of cost recovery through water pricing, EEA Technical Report No 16/2013

European Environment Agency (Ed.), Changes in wastewater treatment in countries of Europe between 1980s and 2005, November 2005

European Environment Agency (Ed.), Effectiveness of urban wastewater treatment policies in selected countries, EEA Report No 2/2005

European Environment Agency (Ed.), European waters – assessment of status and pressures, EEA Report No 8/2012

European Environment Agency (Ed.), Performance of water utilities beyond compliance, EEA Technical Report No 5/2014

European Waste Water Group (Ed.), European Waste Water Catalogue, April 1997

Eurostat Datenbank (<http://epp.eurostat.ec.europa.eu>)

Eurostat (Ed.), Jahrbuch, Luxemburg, 2004 und 2008

Eurostat (Ed.), Jahrbuch der Regionen, Luxemburg, 2008

Eurostat (Ed.), NewsRelease 51/2012, Luxemburg, 2012

Global Virtual University (<http://www.gvu.unu.edu>)

Hulsmann, Adriana, Kiwa Water Research, Implementation of the Drinking Water Directive 98/83/EC in Europe, June 2005

International Water Association, International Statistics for Water Services, 2014

Kristensen, Outlooks on Nutrient Discharges in Europe from Urban Waste Water Treatment Plants, final draft, ed. from EEA European Topic Centre on Water, March 2004

KWR Watercycle Research Institute, The quality of drinking water in the European Union 2005 – 2007, Synthesis report on the quality of drinking water in the Member States of the European Union in the period 2005 – 2007 Directive 98/83/EC, Nieuwegein 2012

Lauber (Ed.), Wasser zwischen öffentlichen und privaten Interessen. Internationale Erfahrungen, Wien 2002

Marhard, Christine, Stand der Umsetzung der Wasserrahmenrichtlinie in Deutschland und Europa, IKONE Kongress, 2004

Mohajeri, Knothe, Lamothe, Faby (Ed.), Aqualibrium, Europäische Wasserwirtschaft im Spannungsfeld von Regulierung und Wettbewerb. Auftrag der Europäischen Kommission, Brüssel 2003

NUS Deutschland Energiekostenberatungsgesellschaft mbH, 28. Weltweiter Wasserpreisvergleich, Düsseldorf 2004

OECD (Ed.), Agricultural Water Pricing in OECD Countries, Document ENV/EPOC/GEEI (98)11/Final, Paris 1999

OECD (Ed.), Household Water Pricing in OECD Countries, Document ENV/EPOC/GEEI (98)12/Final, Paris 1999

OECD (Ed.), Industrial Water Pricing in OECD Countries, Document ENV/EPOC/GEEI (98)10/Final, Paris 1999.

OECD (Ed.), Pricing of Water Services, Paris 1987

OECD (Ed.), The price of Water. Trends in OECD Countries, Paris 1999

OECD (Ed.), Water Subsidies and the Environment, Document OCDE/GD (97)220, Paris 1997

PriceWaterhouse Coopers (Ed.), Method of Evaluation of Investment needs, Financing strategies and consequences on water pricing, (MEIF). European Commission, 2004

Schönböck, Oppolzer, Kraemer u. a., Internationaler Vergleich der Siedlungswasserwirtschaft, ed. vom Österreichischen Städtetag und Bundesarbeitskammer, Wien 2003

Statistisches Bundesamt (Ed.), Statistisches Jahrbuch für das Ausland 2004 und 2006, Wiesbaden 2004, 2006

Statistisches Bundesamt (Ed.), Statistisches Jahrbuch 2008: internationale Übersichten, Wiesbaden, 2008, S. 665 – 723

United Nations (Ed.), World Water Development Report. Water for People Water for Life, 2003

K.-U. Rudolph GmbH/ Ecologic GmbH (Ed.), Vergleich Abwassergebühren im europäischen Rahmen. Forschungsauftrag Nr. 30/96 des Bundesministeriums für Wirtschaft (BMWi und finanziert mit Mitteln des BMWI und des Bundesumweltministeriums), Bonn 1998

Germany

ATT, BDEW, DBVW, DVGW, DWA, VKU (Ed.), Branchenbild der deutschen Wasserwirtschaft 2005, 2008, 2011 und 2014 (Veröffentlichung im 1. Quartal 2015 geplant)

ATV-DVWK (Ed.), Leistungsvergleich kommunaler Kläranlagen 2003

ATV-DVWK (Ed.), Zustand der Kanalisation in Deutschland 2000 zitiert in: BDE, Zahlen und Daten der Entsorgungswirtschaft, 2004

DWA (Ed.), Zustand der Kanalisation in Deutschland 2001 und 2005

BDEW (Ed.), Abwasserdaten Deutschland, 2010

BDEW (Ed.), Abwasserdaten Deutschland Strukturdaten und Entgelte der Abwasserentsorgung, 2014

BDEW (Ed.), Kundenbarometer Wasserversorgung und Abwasserentsorgung, 2009 und 2011

BDEW (Ed.), Marktdaten Wasserwirtschaft 2008

BDEW (Ed.), Preisveränderungsraten beim Trinkwasser, 2013

BDEW (Ed.), Wasserfakten im Überblick, 2012

BDEW (Ed.), Wasserstatistik Bundesrepublik Deutschland, Berichtsjahre 2004 bis 2013

BDEW (Ed.), Wassertarife, 2008

BDEW (Ed.), Wasserverluste seit 1991, 2013

BGW (Ed.), Wasserstatistik Bundesrepublik Deutschland, Berichtsjahre 1997, 2000, 2001, 2002, 2003

BGW (Ed.), Wassertarife 2003

BGW (Ed.), Marktdaten Wasserwirtschaft 2005

BGW/ATV-DVWK (Ed.), Marktdaten Abwasser 2001 und 2003

Bundesministerium für Gesundheit und Umweltbundesamt (Ed.), Bericht des Bundesministeriums für Gesundheit und des Umweltbundesamtes an die Verbraucherinnen und Verbraucher über die Qualität von Wasser für den menschlichen Gebrauch (Trinkwasser) in Deutschland, Bonn/Dessau 2009 und 2011

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Ed.), Aufkommen der Abwasserabgaben 2004 – 2007, 2009

DIW (Ed.), Wochenbericht zum Anlagevermögen der ostdeutschen Länder und Gemeinden, Berlin 2000

DIW (Ed.), Wochenbericht zum infrastrukturellen Nachholbedarf in Ostdeutschland, Berlin 2001

DWA (Ed.), Wirtschaftsdaten der Abwasserbeseitigung 2005, 2007, 2009, 2011 und 2014, 2005, 2007, 2009, 2011 und 2014

DWA (Ed.), Zustand der Kanalisation in Deutschland 2004, 2005, in: Abfall Abwasser 2005, Heft 5, S. 538

DWA (Ed.), 25. Leistungsvergleich kommunaler Kläranlagen, 2012

Grünebaum et al., Hinweise zu Produktkosten der kommunalen Abwasserbehandlung, in: KA – Abwasser, Abfall 2006 (53) Nr. 11

Grünebaum, Stoffbezogene Kosten der kommunalen Abwasserreinigung, in: Gewässerschutz / Wasser / Abwasser Ausgabe 139, Aachen 1993

Grüne Liga e.V. (Ed.), Informationen zur EG-Wasserrahmenrichtlinie, WRRL-Info, Januar 2008

Hannover Messe (Ed.), Ohne Rohrleitungen läuft nichts, Infrastruktur für Wasserver- und Abwasserentsorgung, Pressemitteilung, Pipeline Technology 2006, Hannover

Helmholtz-Zentrum für Umweltforschung und Institut für Infrastruktur und Ressourcenmanagement im Auftrag des Umweltbundesamtes, Praktische Ausgestaltung einer fortzuentwickelnden Abwasserabgabe sowie mögliche Inhalte einer Regelung (vorläufiger Endbericht), 2013

Industrie- und Handelskammer Pfalz (Ed.), Die Wasserentnahmeentgelte der Länder, 2013

Institut für Infrastruktur und Ressourcenmanagement der Universität Leipzig (Ed.), Trinkwasserpreise in Deutschland, Leipzig 2008

Jahresbericht Wasserwirtschaft. Gemeinsamer Bericht der mit der Wasserwirtschaft befassten Bundesministerien, 1990 – 2001

Jessen, Andreas; Ruppert, Bernhard: Jahrhundertprojekt in der Kanalsanierung in Bamberg. In: Tiefbau, Heft 8, Jahrgang 116, 200, S. 478-540

Koziol, Matthias; Veit, Antje; Walther, Jörg: Stehen wir vor einem Systemwechsel in der Wasserver- und Abwasserentsorgung? Sektorale Randbedingungen und Optionen im stadttechnischen Transformationsprozess, Berlin 2006. In: netWORKS-Papers, Heft 22

maqua/BGW (Ed.) Das Kundenbarometer, Bonn 2005

o.V.: Notwendige Lebensdauer der öffentlichen Kanäle in Deutschland beträgt 248 Jahre in EUWID 40.2013

Pecher, Klaus Hans: Entwicklung des Kanalnetzes in Deutschland und Ansätze zur wirtschaftlichen Optimierung der notwendigen Netzsanierung, Vortrag Abwasserforum 2009

Rödl & Partner, Benchmarking Wasserversorgung in Hessen, Nürnberg 2005

Rödl & Partner, Benchmarking Wasserversorgung in Thüringen, Nürnberg 2003

Rödl & Partner, Effizienz- und Qualitätsuntersuchung der kommunalen Wasserversorgung in Bayern (EffWB), Nürnberg 2004 und 2008

Schwarz, Thomas: Zweiter Lebenszyklus von Kanalnetz und Kläranlagen. Konferenz kommunales Infrastrukturmanagement, Berlin, 06. August 2008

Statistisches Bundesamt (Ed.), Abwasserschädlichkeiten für das Berichtsjahr 2001 – Sonderaufbereitung der Statistik der öffentlichen Abwasserbeseitigung, Wiesbaden 2003

Statistisches Bundesamt (Ed.), Entwicklung der Zahl der kreisfreien Städte, Landkreise und Gemeinden, Lange Reihe 7, 2010

Statistisches Bundesamt (Ed.), Statistisches Jahrbuch für die Bundesrepublik Deutschland 2004, Wiesbaden 2004

Statistisches Bundesamt (Ed.), Produzierendes Gewerbe, 2004 und 2007, Fachserie 4, Reihe 6.1, 2006 und 2009

Statistisches Bundesamt (Ed.), Umwelt, Öffentliche Wasserversorgung und Abwasserbeseitigung 2001, 2004 und 2007, Fachserie 19, Reihe 2.1, 2003, 2006 und 2009

Statistisches Bundesamt (Ed.), Umwelt, Öffentliche Wasserversorgung und Abwasserentsorgung 2010, Fachserie 19, Reihe 2.1, 2013

Statistisches Bundesamt (Ed.), Umwelt, Öffentliche Wasserversorgung und Abwasserentsorgung nach Ländern 2010 – Anschlussgrad und Wasserabgabe, 2012

Statistisches Bundesamt (Ed.), Umwelt, Wasserwirtschaft in Deutschland 2007 und 2010 Diagramm, 2014

Statistisches Bundesamt (Ed.), Umweltnutzung und Wirtschaft 2013, 2013

Statistisches Bundesamt (Ed.), Umwelt, Ausgewählte Ergebnisse der Umweltökonomischen Gesamtrechnungen und der Umweltstatistik 2003, Presseexemplar, 2003

Statistisches Bundesamt (Ed.), Verbraucherpreisindizes für Deutschland 2008, Fachserie 17, Reihe 7, 2009

Wibera (Ed.): Statistik Substanzwert Infrastruktur Deutschland

England/Wales

Department for Environment, Food and Rural Affairs (Ed.), Waste water treatment in the United Kingdom – 2012, 2012

Department for Environment, Food and Rural Affairs (Ed.), The Independent Review of Charging for Household Water and Sewerage Services 2009

DWI (Ed.), Drinking water 2010 Public water supplies; Berichte zu sieben Regionen in England und Wales, London 2011

DWI (Ed.), Drinking water 2012 Private water supplies in England, London 2013

DWI (Ed.), Drinking water 2012 Private water supplies in Wales, London 2013

DWI (Ed.), Drinking Water Annual Report 2001, 2003, 2007

Ecologic / ifip TU-Wien im Auftrag des österreichischen Städtebundes: Internationaler Vergleich der Siedlungswasserwirtschaft – Band 2: Länderstudie England und Wales, 2003

EIONET, UK Drinking Water Data Return 2008 – 2010 (revised)

Hall, David; Lobina, Emanuelle: Water Companies in Europe 2007, 2007

OFWAT (Ed.), Cost of water delivered and sewage collected, 1995/96

OFWAT (Ed.), Customer Charges Data 2010 – 11, 2011

OFWAT (Ed.), Delivering sustainable water – OFWAT's strategy, 2010

OFWAT (Ed.), Financial performance and expenditure of the water companies in England and Wales 2009 – 10, 2010

OFWAT (Ed.), June Returns 2004, 2007 und 2009

OFWAT (Ed.), Levels of service for the water industry in England/Wales, 2002 – 2003, 2006 – 2007 report

OFWAT (Ed.), Principal Statement of Water Companies 2003

OFWAT (Ed.), International comparison of water and sewerage service 2007 report, 2008

OFWAT (Ed.), Report of the financial performance and expenditure of the water companies in England and Wales, 1998/1999, 1999/2000, 2000/01, 2001/02, 2002/03, 2003/04, 2007/08 reports

OFWAT (Ed.); Report on Leakage and Water Efficiency, 1997 – 98 report

OFWAT (Ed.), Tariff structure and charges, 2003/2004, 2004/2005, 2007/08 report

OFWAT (Ed.), Security of supply, leakage and the efficient use of water, 2002/03, 2006/07 report

OFWAT (Ed.), Special agreement register 2009 – 10

OFWAT (Ed.), Value of grants received by the E&W water sector for 2007 – 08 (not published)

OFWAT (Ed.), Water and sewerage charges, 2007/2008 report

OFWAT (Ed.), Water and sewerage service unit costs and relative efficiency, 2003/04, 2005/06, 2007/08 report

ONS (Ed.), Key Statistics for Urban Areas, Census 2001, 2007

U.K. water companies invest in metering. In: Metering.com (<http://www.metering.com>), 27.11.2009

Water UK (Ed.), Who's who in the water industry 2007

Waterwise, Water – the facts, 2014

France

AFP Agence France-Presse GmbH (Ed.); EU-Kommission zieht gegen Frankreich vor EuGH, Behörde bemängelt Verschmutzung mit ungeklärten Abwasser, 2009

Agences de l'Eau (Ed.), Information on Website 2009

Berland, Le parc technique d'assainissement et d'épuration, premier éléments pour une synthèse, 2002

BIPE/FP2E: Les services collectifs d'eau et d'assainissement en France. – 3. Ausgabe, 2008 und 5-Aufgabe, 2012

Dugleux, Enjeux et contexte réglementaire, le rendement des réseaux d'eau potable. TECHN'EAU 2009, le 27 mars 2009 à Mamirolle

Eaufrance (Ed.); Observatoire des services publics d'eau et d'assainissement – 2010, 2014

Eaufrance (Ed.); Observatoire des services publics d'eau et d'assainissement, 2012

Ernst & Young (Ed.), Étude relative au calcul de la récupération des coûts des services liés à l'utilisation de l'eau pour les districts hydrographiques français, 2004

IFEN (Ed.); Base de données Eider (<http://eider.ifen.fr/Eider/>), Stand 2010

IFEN (Ed.), IFEN-Scees, Enquête Eau 1998, 2001, 2004

IFEN (Ed.), L'épuration des eaux usées urbaines, 2004

IFEN (Ed.), Les Comptes Économiques de l'Environnement en 2002, 2004, 2005, 2007

IFEN (Ed.), Les données de l'environnement, 800000 km de conduites pour distribuer l'eau potable, 2001

IFEN (Ed.), Les données de l'environnement, De l'eau à tous prix, 2004

IFEN (Ed.), Les données de l'environnement, la facture d'eau domestique en 2004, 2007

IFEN (Ed.), Les données de l'environnement, Les progrès de la collecte des eaux usées et pluviales, 2004

IFEN (Ed.), Les données de l'environnement, L'épuration des eaux usées urbaines, 2004

IFEN (Ed.), Les dossier; les services publics de l'assainissement, 2008

INSEE (Ed.), Population, densité et part de la population urbaine des principaux pays du monde 2007, 2009

INSEE (Ed.), Population en France métropolitaine (en milliers) 1975 – 2009, 2010

INSEE (Ed.), Recensement de la population 2006, 2009

Ministère chargé de la Santé – DDASS – SISE – EAUX, 2001

Ministère de l'Ecologie, du Développement durable et de l'Énergie (Ed.); L'économie de l'environnement; éditions 2010 (2012) and 2011 (2013)

Ministère de l'Ecologie, du Développement durable et de l'Énergie; .); Base de données Eider (<http://eider.ifen.fr/Eider/>), Stand 2014

Ministère de l'Ecologie, du Développement durable et de l'Énergie; Base de données SISPEA (<http://services.eaufrance.fr/actualite/sispea-mise-jour-au-27-mars-2013-des-donn-es-des-services-telechargeables-sur-site-de-lob>s), Stand 2014

Ministère de la Santé, de la Jeunesse, des Sports et de la Vie associative (Ed.); L'eau potable en France 2005 – 2006, Paris, 2008

Office Parlementaire d'évaluation des choix scientifiques et technologiques, Rapport sur la qualité de l'eau et de l'assainissement en France, 2003

OIEAU (Ed.); Inventaire et scénario de renouvellement du patrimoine d'infrastructures des services publics d'eau et d'assainissement, synthèse, 2002 et 2003

OIEAU (Ed.); Water supply and sanitation management in France, 2009. Water Governance Workshop, 7 & 8 of July 2009

Senat France (Ed.), , 13 décembre 2007

Smets, Implementing the right to water in France, Geneva, 2007

Netherlands

CBS Statline (Ed.), Webseite statline.cbs.nl

Centraal Bureau voor de Statistiek (Ed.), Web-magazine

Handbook Biological Wastewater Treatment, Webseite Wastewaterhandbook.com

Ministerie van Infrastructuur en Milieu, De kwaliteit van het drinkwater in Nederland in 2011, Utrecht 2012

Ministerie van Verkeer en Waterstaat (Ed.), Water in Beeld 2009

Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (VROM) (Ed.), De kwaliteit van het drinkwater in Nederland in 2007, 2009

Oosterom, Eric: Transparency and improvement combined: the development of the benchmark municipal water management, 2009

Rioned (Ed.), Onderzoek regenwateroverlast in de bebouwde omgeving, August 2007

Rioned (Ed.), Urban drainage statistics 2009 – 10

Rioned (Ed.), Riolerling in beeld, 2013

Unie van Waterschappen (Ed.), de waterschapsbelastingen in 2014, 2014

Unie van Waterschappen (Ed.), Climate Change and Dutch Water Management, December 2008

Unie van Waterschappen (Ed.), Water governance, the Dutch waterschap model, 2008

Unie van Waterschappen (Ed.), Zuiver Afvalwater 2012, 2013

VEWIN (Ed.), Dutch Drinking Water Statistic 2012

VEWIN (Ed.), Drinking Water Fact Sheet 2010 to 2013

VEWIN (Ed.), Water supply statistics 2000 to 2007

VEWIN (Ed.), Reflections on performance 2006 und 2013

Austria

BMLFUW (Ed.), Benchmarking in der Siedlungswasserwirtschaft – Kurzbericht, Wien 2001

BMLFUW (Ed.), Benchmarking in der Siedlungswasserwirtschaft – Endbericht, Wien 2001

BMLFUW (Ed.), Daten und Zahlen 2009 und 2013, 2009 und 2013

BMLFUW (Ed.), Evaluierung der Umweltförderungen des Bundes für den Zeitraum 01.01.2002 bis 31.12.2004

BMLFUW (Ed.), Evaluierung der Umweltförderungen des Bundes für den Zeitraum 01.01.2005 bis 31.12.2007

BMLFUW (Ed.), Kommunale Abwasserrichtlinie der EU – 91/271/EWG Österreichischer Bericht 2008 und 2012, 2008 und 2012

BMLFUW (Ed.), Kommunale Abwasser, 2014

BMLFUW (Ed.), Ökonomische Analyse der Wassernutzung für den Sektor Kommunale Wasserversorgung & Abwasserentsorgung bis 2004, 2003

BMLFUW (Ed.), Umweltförderungen des Bundes 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2012

Bundesministerium für Gesundheit (Ed.), Österreichischer Trinkwasserbericht 2005 – 2007 und 2008 – 2010, Wien 2009 und 2013

Klein, Michael und Kostal, Thomas: Lokale Monopole oder strategische Interaktion? Eine empirische Analyse kommunaler Wassergebührenpolitik, Vortrag Konferenz Kommunales Infrastrukturmanagement, Berlin, Juni 2010

ÖVGW (Ed.), Abschlussbericht QVGW Benchmarking 2012

ÖVGW (Ed.), Die Österreichische Trinkwasserwirtschaft 2009 und 2013

Statistik Austria und Österreichischer Städtebund (Ed.), Österreichs Städte in Zahlen 2008, Wien 2008

Poland

Aktualizacja Krajowego programu oczyszczania ścieków komunalnych (AKPOSK) 2009, Warschau, Februar 2010

Bartczak, Kopanska, Raczka: The perspectives of water sector in Poland, Warsaw university, 2006

Central Statistical Office (Ed.), Localities 2000 – 2008, Regional database, 2010

EIONET, Poland 98/83/EC Report (2008 – 2010), <http://cdr.eionet.europa.eu/pl/eu/dwd>.

GHK (Ed.), Strategic Evaluation on Environment and Risk Prevention under Structural and Cohesion Funds for the period 2007 – 2013, National Evaluation Report for Poland, Executive Summary, Brussels, November 2006

GUS (Ed.), municipal infrastructure in 2007 tables

GUS (Ed.), Ochrona srodowiska 2005 – 2013

GUS (Ed.), regional database

Inspection for Environmental Protection, The State of environment in Poland 1996 – 2001, Warsaw 2003

Koc, Economic and social aspects of the development of waste water charges in Poland, Ministry of Environment, Warsaw, 2001

Kopanska, öffentlich-private Partnerschaften bei der Wasserversorgung und Abwasserbeseitigung in Polen, Warsaw university, 2009

Krajowego programu oczyszczania ścieków komunalnych (KPOSK) 2005

OECD, Environmental Performance Reviews

Österreichische Gesellschaft für Politikberatung und Politikentwicklung ÖGPP (Ed.), Privatisierung und Liberalisierung öffentlicher Dienstleistungen in der EU/neue Mitgliedstaaten: Polen, Juni 2004

Robin de la Motte, PSIRU, Business School, University of Greenwich: D10i WaterTime National Context Report – Poland, Januar 2005

The National Fund for Environmental Protection and Water Management (Ed.), Scope of activities of the National Fund, 2010