



# Statistics in focus

## ENVIRONMENT AND ENERGY

THEME 8 – 13/2003

### ENVIRONMENT

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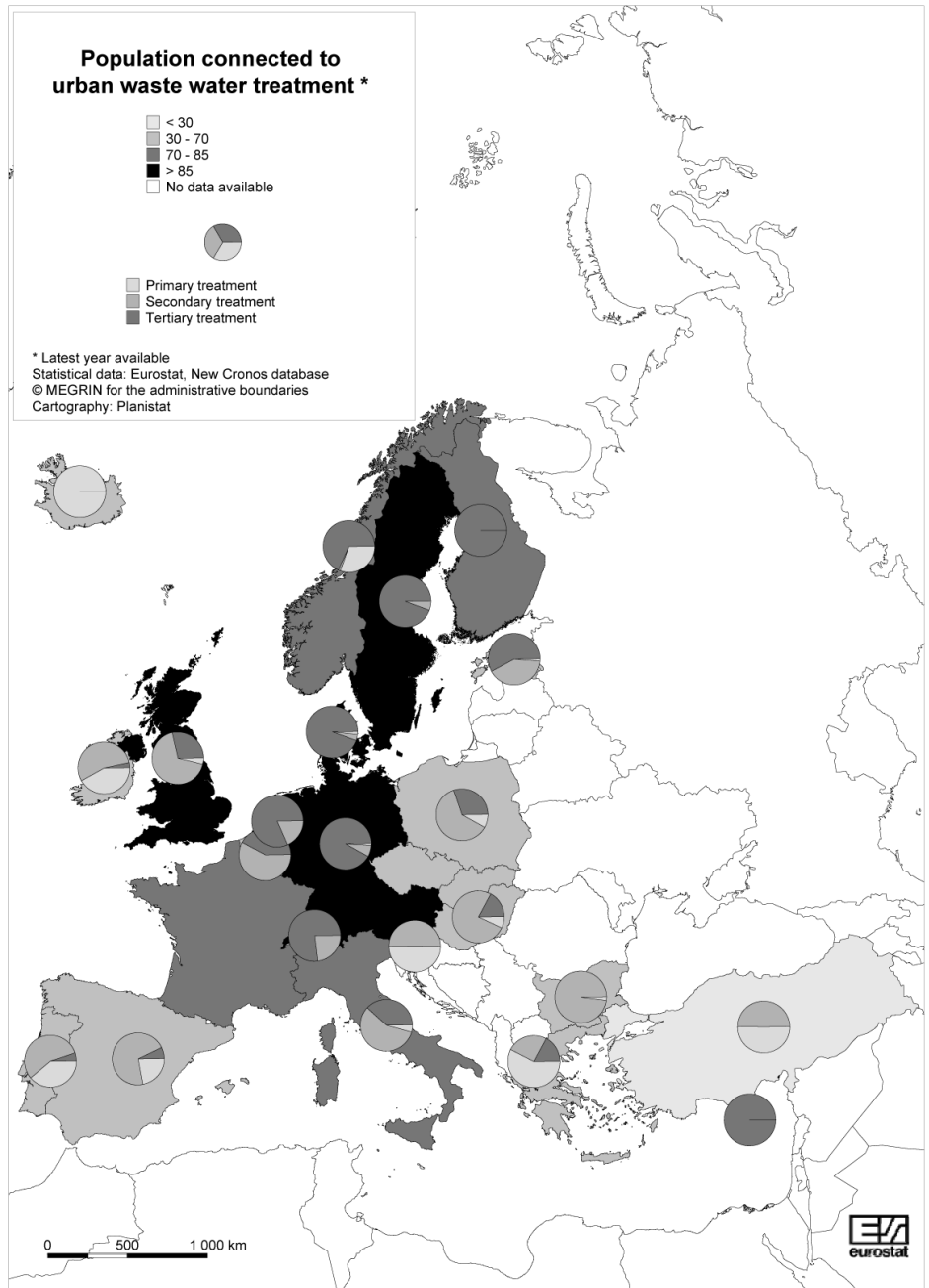
Manuscript completed on: 04.07.2003  
ISSN 1562-3106  
Catalogue number: KS-NQ-03-013-EN-N  
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# Water use and waste water treatment in the EU and in Candidate Countries

*Ulrich Wieland*

For most people in Europe, access to clean water in abundant quantity is taken for granted. Most people do not realise, however, that many human activities place a burden on water quality and quantity. Water polluted by households, industry or agriculture returns back into rivers, lakes or ground water and may cause damage to human health or to the environment.

Water supply, use and waste water treatment is strongly linked to the economic and social development of countries. Typical indicators in this domain are the percentages of population connected to public water supply or to urban waste water collection and treatment. The following map on urban waste water treatment facilities show low figures especially in the Candidate Countries and in economically less developed EU countries.



## Water use

Water users can be grouped into four main categories: agriculture, manufacturing industries, production of electricity and domestic sector (including households and service activities). The various users are served either by distribution networks (public water supply, other supply) or they abstract ground or surface water themselves (self-supply).

prejudging a degree of utility or a performance of use. These quantities are lower than those abstracted, mainly because of losses in the distribution system.

Public water supply (PWS) refers to all public water networks which can distribute water to the domestic sector but also to other sectors (agriculture, industry, etc...). Nevertheless, in most countries the domestic sector is the main beneficiary of public water supply.

The following table indicates the quantities of water used by sector, i.e. the volumes of water supplied to the users and used, without

**Table 1: Water use by user and by supply category**

(*mio m<sup>3</sup>*)

Year	Public water supply					Self-supply					Other supply	
	Total	Agriculture	Manufacturing industry	Production of electricity	Domestic sector	Total	Agriculture	Manufacturing industry	Production of electricity	Domestic sector	Total	Agriculture
BE* 1998	559.4	17.9	94.2	2.7	381.1	:	20.0	1 479.9	4 312.9	1.1	:	:
DK 2000	416.9	:	:	:	:	:	:	:	:	:	:	:
DE* 1998	4 859.0	:	387.0	46.0	3 814.0	:	:	5 306.0	26 201.0	:	889.0	:
EL	:	:	:	:	:	:	:	:	:	:	:	:
ES 2000	3 784.1	19.7	2.4	:	3 478.8	:	:	134.0	:	:	:	17 757.4
FR 1998	4 000.0	:	:	:	:	:	:	:	:	:	:	:
IE	:	:	:	:	:	:	:	:	:	:	:	:
IT	:	:	:	:	:	:	:	:	:	:	:	:
LU 1999	36.9	0.2	:	:	31.0	14.1	0.1	13.9	-	:	-	:
NL 1996	1 248.0	81.0	213.9	3.3	949.0	8 740.0	230.0	2 308.4	6 195.0	:	:	:
AT 1997	604.3	:	:	:	:	:	:	:	:	:	:	:
PT	:	:	:	:	:	:	:	:	:	:	:	:
FI* 1999	404.0	:	:	:	404.0	:	:	936.0	256.0	:	:	:
SE* 2000	720.0	:	102.0	:	526.0	2 242.0	150.0	1 906.0	97.0	89.0	:	:
UK 2000	5 471.7	:	:	:	:	:	:	:	:	:	:	:
BG 2001	424.1	1.7	54.0	3.7	352.4	4 282.9	10.3	268.2	3 932.1	15.0	277.6	172.8
CY 1998	68.0	24.0	:	:	:	117.0	105.0	:	:	12.0	:	:
CZ* 2001	535.6	6.7	:	:	339.3	947.0	12.0	:	502.0	28.6	:	:
EE 1999	71.5	:	:	:	:	1 215.0	36.4	27.1	1 116.3	:	-	:
HU* 2000	560.1	:	34.2	8.5	388.1	4 836.4	499.4	285.8	3 981.5	22.4	:	:
LV 2001	302.4	8.6	78.5	118.8	77.8	54.2	36.0	34.4	0.0	10.7	:	:
LT	:	:	:	:	:	:	:	:	:	:	:	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL* 2001	1 671.3	:	22.6	11.4	1 310.4	8 436.6	1 036.1	628.3	6 580.7	:	:	:
RO 2001	2 462.0	:	:	:	:	:	:	:	:	:	:	:
SK 2001	394.7	:	:	:	:	743.7	69.6	:	:	:	:	:
SI* 2000	108.2	19.0	0.7	:	88.0	86.0	84.8	:	:	:	6.6	6.6
TR 1997	:	:	29.6	:	:	:	:	1 507.8	2 655.0	:	:	:
IS* 2001	62.0	-	:	-	30.0	75.0	63.0	:	-	2.0	:	:
NO 1999	768.0	:	:	:	376.0	1 662.0	:	1 662.0	:	:	:	:
CH 1997	1 055.5	:	:	:	740.3	1 503.0	:	:	:	:	:	:

Notes: BE, DE, FI, SE, CZ, HU, PL, SI and IS: domestic sector refers only to households.

BE: all data, except 'Total' refers to Flanders and Wallonia

UK: refers to England and Wales only

SI: 'other supply' refers to irrigation only

IS: preliminary data

NO: 'total' includes leakage

## Low water use by households in the Candidate Countries

**Table 2: Water use by households**

	Year	mio m <sup>3</sup>	l/capita/day	% of PWS	% of population connected to PWS
BE*	1998	381	113	68.14	:
DK	1994	301	158	60.97	:
DE	1998	3 814	129	78.54	98.90
EL	1997	670	175	:	:
ES	2000	2 531	174	66.94	:
FR*	1998	3 491	165	87.28	99.20
IE	:	:	:	:	:
IT	:	:	:	:	:
LU	1999	23	149	63.55	:
NL	1996	733	129	58.73	100.00
AT	1997	456	155	75.40	:
PT	1998	680	184	:	:
FI	1999	404	214	100.00	:
SE	2000	526	162	73.06	:
UK	:	:	:	:	:
BG	2001	273	96	64.38	98.50
CY	:	:	:	:	:
CZ	2001	339	104	63.35	87.30
EE	2000	:	:	:	70.00
HU	2000	388	106	69.28	97.90
LV	:	:	:	:	:
LT	:	:	:	:	:
MT	:	:	:	:	:
PL	2001	1 310	93	78.41	:
RO*	2000	1 106	135	42.39	:
SK	2001	:	:	:	:
SI	2000	88	121	81.28	:
TR	1996	1 534	68	:	:
IS	2001	30	304	48.39	95.00
NO*	1999	376	234	48.96	88.60
CH	1997	649	249	61.52	:

Notes: BE: refers to Flanders and Wallonia

FR, RO: households refers to domestic sector

NO: percentage of population connected to PWS refers to year 2001

Water use by households is statistically evaluated through the volumes supplied by public water supply (water companies) to households. This use can be slightly underestimated due to a potential self-supply by households (e.g. watering from drills).

The amount of water used per capita per day is calculated using the total population of the country. As a result, the quantity of water used per capita is underestimated for countries where a significant proportion of the resident population is not connected to the

distribution network. The quantity may also be overestimated in countries where a substantial amount of water is used for tourism.

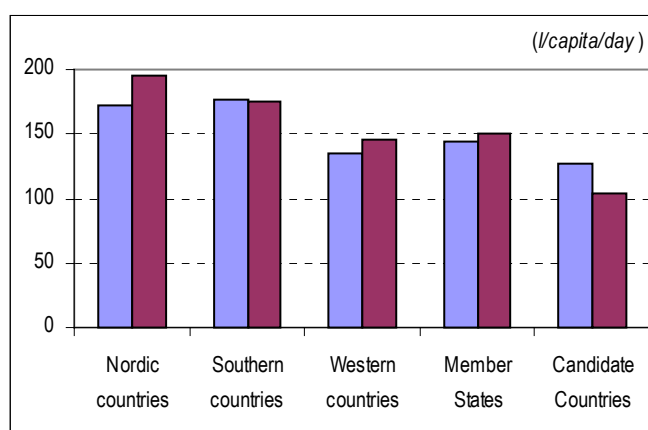
The amount of water distributed to households varies widely within Europe. The annual European Union average is approximately 150 l/capita/day, whereas in the Candidate Countries it is 105 l/capita/day. These low amounts can partly be explained by the fact that self-supply by the domestic sector is still more important in the Candidate Countries than in most EU countries.

In the Member States, it ranges from 113 l/capita/day in Belgium to 214 l/capita/day in Finland. Even higher amounts can be found in the EFTA countries (over 200 l/capita/day). While in the Candidate Countries, it ranges from 68 l/capita/day in Turkey to 135 l/capita/day in Romania. The highest amount of water used by households is found in the Nordic countries, while the lowest are found in the Candidate Countries.

Apart from the above-mentioned potential over- and under-estimation, a main reason for the differences between countries might be the water prices. In fact, countries with high water prices (DE, BE, NL, AT and DK) have relatively low figures on water use. However, the same logic does not apply to Candidate Countries and a more detailed analysis would be needed to verify this relationship.

During the past 15 years, water use by households decreased in the Candidate Countries (-18%) and increased in the Member States (+5%). The most important increase can be found in Nordic countries (+13%).

**Figure 1: Evolution of water use by households in regions of Europe**



Notes: The first bar refers to the mid-80's, whereas the second bar refers to end-90's/beginning 2000.

Only countries with data from both periods included; Nordic countries: FI, SE, IS, NO; Southern countries: ES, PT; Western countries: BE, DK, DE, FR, LU, NL, AT, CH; Member States: BE, DK, DE, ES, FR, LU, NL, AT, FI, SE; Candidate Countries: BG, CZ, HU, LV, PL, RO, SI.

## Low percentage of population connected to tertiary treatment in the Candidate Countries

Waste water from households, industry and agriculture represents a significant pressure on the water environment. The level of treatment of the waste water before discharge and the sensitivity of the receiving waters will affect the impact it has on the aquatic system.

Waste water is discharged into the environment, either directly or after treatment. Part of the waste water is collected and treated in urban waste water plants, directly treated in the industry itself or by independent treatment.

The [Urban Waste Water Directive](#)<sup>1</sup>, which prescribes the level of treatment required before discharge, distinguishes between sensitive and less sensitive areas. Urban waste water in sensitive areas should receive tertiary treatment, whereas urban waste water in less sensitive areas should receive at least secondary treatment.

Most statistics available on waste water concern only the domestic sector and the urban waste water treatment. The urban waste water collecting system collects domestic effluents, together with part of industrial waste water and/or run-off water.

The percentage of population connected to urban waste water collecting systems is relatively high in most of the studied countries. Countries with low figures (Cyprus 34.5%, Hungary 51.1%, Slovenia 53%, Turkey 53.2% and the Slovak Republic 54%) are countries with typically large rural populations, where important parts of the waste water is treated by independent treatment plants (e.g. septic tanks). Highly industrialised countries have connection rates of 80% and above.

The percentage of population connected to urban waste water treatment plants shows a contrasted situation. Most of the Member States have a treatment rate close to 100%

**Table 3: Population connected to waste water treatment plants**

(%)

Year	Urban waste water collecting system					Without treatment	Independent waste water collecting system	of which with: Independent treatment
	with treatment				Total			
	Primary treatment	Secondary treatment	Tertiary treatment	Total				
BE 1998	-	22.0	16.1	38.1	44.4	17.3	:	
DK 1998	1.6	3.4	84.0	89.0	0.0	10.9	10.9	
DE 1998	1.1	6.3	83.1	91.0	2.2	6.8	4.7	
EL 1997	32.4	14.2	9.6	56.2	11.3	32.2	:	
ES 1995	10.6	34.4	3.3	48.3	:	:	:	
FR 1998	:	:	:	76.9	2.2	18.4	10.0	
IE 1995	24.0	31.8	1.8	57.6	:	32.0	:	
IT 1995	2.9	36.1	24.1	75.0	:	:	:	
LU 1999	:	:	:	93.0	-	7.0	7.0	
NL 2000	-	18.1	80.0	98.1	-	1.9	:	
AT 2001	:	:	:	86.0	-	14.0	14.0	
PT 1998	17.8	26.0	2.3	46.0	36.0	18.0	4.7	
FI 2001	-	-	81.0	81.0	-	19.0	:	
SE 2000	-	5.0	81.0	86.0	-	14.0	:	
UK* 2000	3.6	64.0	27.0	94.6	2.0	3.4	:	
BG 2001	0.9	37.2	-	38.2	29.7	32.1	:	
CY* 2000	-	-	34.5	34.5	-	65.5	65.5	
CZ 2001	:	:	:	67.5	7.4	25.1	:	
EE 2000	1.0	28.0	40.0	69.0	1.0	30.0	:	
HU 2000	2.3	24.4	5.5	32.2	19.0	48.8	17.1	
LV	:	:	:	:	:	:	:	
LT	:	:	:	:	:	:	:	
MT 2001	:	:	:	13.0	87.0	:	:	
PL 2001	3.2	28.8	22.7	54.7	:	:	:	
RO	:	:	:	:	:	:	:	
SK 1998	:	:	:	48.8	5.2	46.0	:	
SI 1999	15.0	15.0	-	30.0	23.0	47.0	45.0	
TR 1998	8.3	8.3	-	16.6	36.6	:	:	
IS 2001	33.0	-	-	33.0	57.0	10.0	6.0	
NO 2000	22.0	1.0	50.0	73.0	7.0	20.0	20.0	
CH 2000	-	22.0	74.0	96.0	-	4.0	:	

Notes: UK refers only to England and Wales.

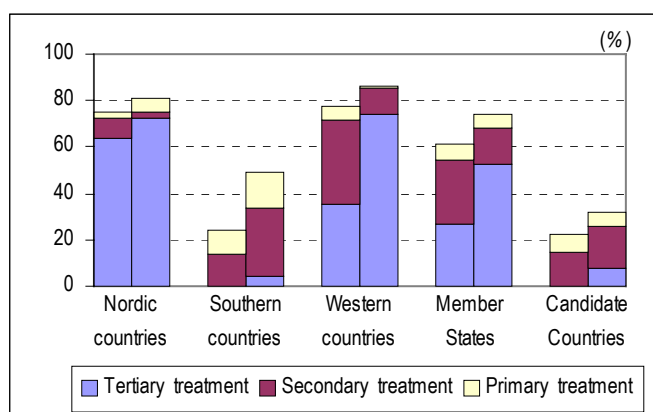
CY: refers to the Government controlled area of Cyprus only.

of the waste water collected by urban waste water collection systems. For most of the Candidate Countries, this rate is lower. However, Belgium, Malta, Turkey and Iceland treat less than half of the collected waste water.

Independent treatment plays an important role in some countries (Cyprus and Slovenia). This kind of treatment can be efficient in rural areas or scattered settlements.

<sup>1</sup> 91/271/EEC, see OJ L135, 30.5.1991, p.40

**Figure 2: Evolution of population connected to urban waste water treatment plants in regions of Europe**



Notes: The first bar refers to the mid-80's, whereas the second bar refers to the end-90's/beginning 2000.

Only countries with data from both periods are included. Nordic countries: FI, SE, IS, NO; Southern countries: EL, ES, PT; Western countries: BE, DK, DE, IE, NL, UK, CH; Member States: BE, DK, DE, EL, ES, IE, NL, PT, FI, SE, UK; Candidate Countries: BG, EE, HU, PL, TR.

There are some key differences in the level of urban waste water treatment between the different regions of Europe. The highest rate of population connected to urban waste water is found in Western countries, followed by Nordic countries, whereas the lowest rates are found in Southern and Candidate Countries.

As illustrated by Figure 2, the highest percentage of population connected to tertiary treatment plants (which includes efficient removal of nutrients – nitrogen and phosphorus – and organic matter from waste water), can be found in Nordic and Western countries, whereas in the Southern and the Candidate Countries secondary treatment is predominant.

Over the past 15 years, significant progress was made in connecting population to urban waste water collection and treatment systems, and in improving the quality of the treatment (Figure 2). The percentage of the population connected to tertiary treatment has increased since the mid-80's in all European regions, but in the Southern and Eastern countries this percentage is still very low (4% and 6% respectively).

## Increase in the design capacity of urban waste water treatment plants

**Table 4: Number and capacity of urban waste water treatment plants**

	Year	Primary treatment			Secondary treatment			Tertiary treatment		
		Number of plants	Design capacity	Actual occupation	Number of plants	Design capacity	Actual occupation	Number of plants	Design capacity	Actual occupation
		1000 kg O <sub>2</sub> /day			1000 kg O <sub>2</sub> /day			1000 kg O <sub>2</sub> /day		
BE	1996	-	-	-	336	326.0	191.9	12	39.6	25.5
DK	1998	457	14.3	8.7	501	24.9	14.3	515	684.3	502.5
DE	1998	786	83.0	68.0	4 676	564.0	424.0	4 850	8 719.0	6 852.0
EL	1997	11	265.7	215.8	106	112.2	87.8	23	73.9	53.7
NL	2000	-	-	-	179	238.1	171.5	220	1 125.3	797.1
AT	2001	-	-	-	766	:	84.8	721	:	723.0
UK*	2000	678	:	95.0	4 065	:	2 600.0	1 546	:	1 179.0
CZ	1999	39	0.7	0.7	920	748.3	444.0	-	-	-
PL	2001	133	115.4	:	1 922	1 396.5	:	503	1 095.9	:
SI	2000	34	15.4	9.8	68	36.4	25.4	8	8.2	7.9

Notes: UK refers to England and Wales

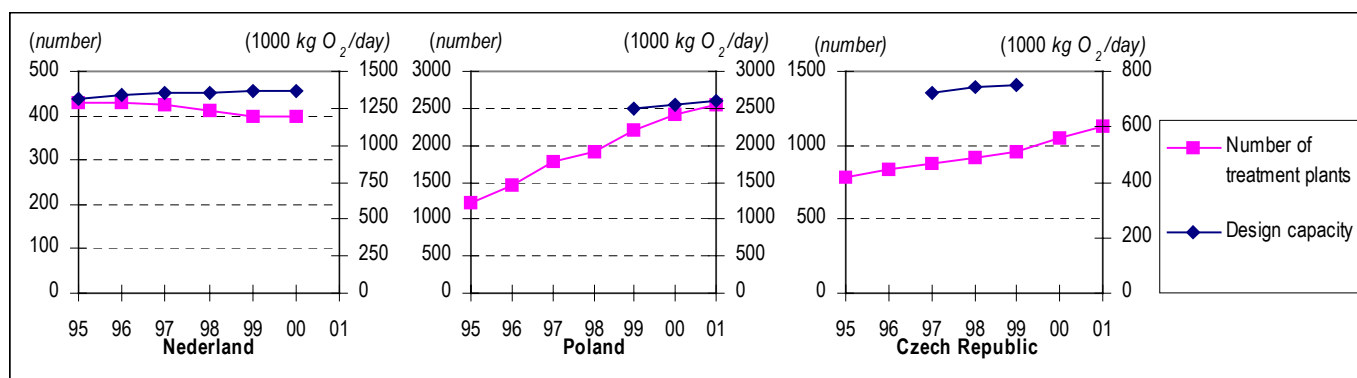
Only a few countries have time series on the number and capacity of

treatments plants. The trend observed in the Member States seems to be a

decrease in the number of treatment plants together with an increase in the global capacity: old treatment plants are replaced by plants with higher capacity and with more advanced technology. For instance, in the Netherlands, during the period studied, the number of treatment plants decreased (-7%) whereas the design capacity increased (+3%). In 2000, tertiary treatment plants accounted for 55% of the total number of treatment plants but represents 83% of the total design capacity.

In the Czech Republic and Poland, the number of treatment plants as well as the design capacity are increasing. In these countries, the treatment capacity still has to be developed, both in terms of treatment technology and in percentage of the population connected.

**Figure 3: Evolution of the number and design capacity of urban waste water treatment plants in selected countries**



## Landfill and agriculture: predominant ways of sewage sludge disposal

Sewage sludge originates from the process of treatment of waste water. Due to the physical-chemical processes involved in waste water treatment, the sludge tends to concentrate heavy metals and poorly biodegradable organic compounds as well as potentially pathogenic organisms (viruses, bacteria etc). Sewage sludge is, however, rich in nutrients such as nitrogen and phosphorous and contains valuable organic matter that is useful when soils are depleted or subject to erosion. The organic matter and nutrients are the two main elements that make the spreading of this kind of waste on land suitable. It serves as a fertiliser or an organic soil improver.

The progressive implementation of the [Urban Waste Water Directive](#) in all Member States increases the quantities of sewage sludge requiring disposal. From an annual production of some 6.5 million tonnes of dry solid at the end of the 80's, the production is now about 8 million tonnes which represents around 23 kg of dry solid per capita per year. This increase is mainly due to the practical implementation of the Directive, implying the constant rise in the number of households connected to sewers and the increase in the level of treatment.

The [Sewage Sludge Directive](#)<sup>2</sup> seeks to encourage the use of sewage sludge in agriculture and to regulate its use to prevent harmful effects on soil,

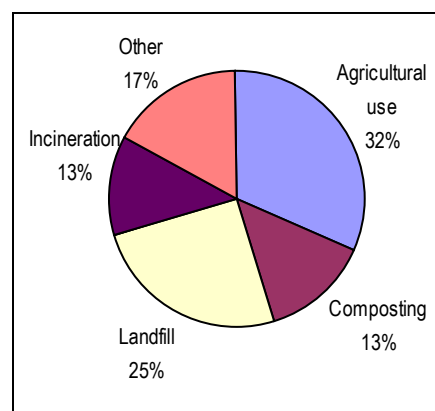
vegetation, animals and human. The Directive also requires that the sludge does not impair the quality of the soil and of the surface and groundwater.

In the Candidate Countries (CZ, HU, PL, SI and SK are the only countries which provide data on sewage sludge disposal), less than 1 million tonnes of dry solid per year of sewage sludge is produced, which represents around 12 kg of dry solid per capita per year.

The type of disposal varies between Candidate Countries and Member States (Figures 3 and 4). In the Candidate Countries, landfill prevails (39%), followed by the agricultural use (38%) and composting (6%). In the Member states, it is the agricultural use which prevails (32%), followed by landfill (25%), composting (13%) and incineration (13%). Although at European level the reuse of sludge (agricultural use, composting) accounts for about 40% of the overall sludge production, landfill as well as incineration in some countries are the most widely used disposal outlets, despite their environmental drawbacks.

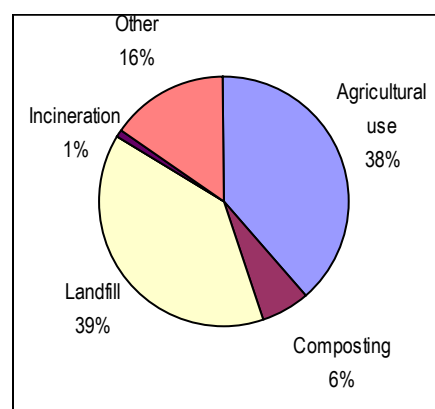
For most of the countries, where data is available, the quantity of sludge produced per capita has increased over the last 10 years. It has decreased only in Germany, Luxembourg and Switzerland (Figure 5).

**Figure 4: Sewage sludge disposal in Member states**



Note: latest year available.

**Figure 5: Sewage sludge disposal in Candidate countries**

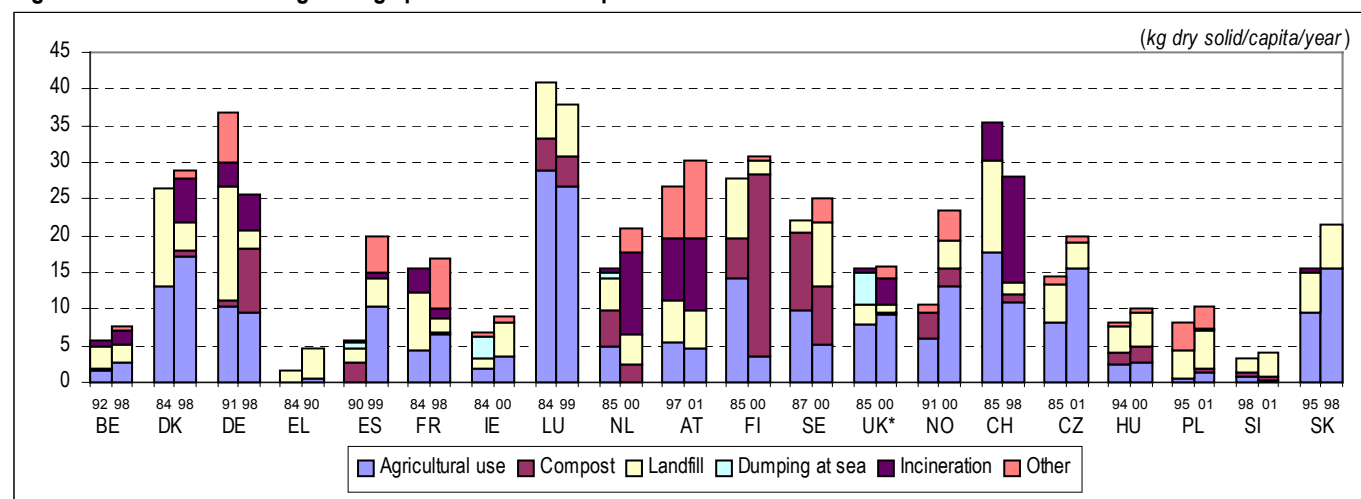


Notes: latest year available.

Candidate countries include only CZ, HU, PL, SI and SK.

<sup>2</sup> 86/278/EEC, see OJ L181, 04.07.1986, p6

**Figure 6: Evolution of sewage sludge production and disposal in selected countries**



Note : UK refers only to England and Wales.

## ➤ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

The data used in this *Statistics in focus* is from the Joint OECD/Eurostat Questionnaire 2002, section Inland waters.

When interpreting this data, it should be borne in mind that definitions and estimation methods employed by countries may vary considerably.

The definitions of the parameters used in this *Statistics in focus* are given below:

**Public water supply:** water supplied by economic units engaged in collection, purification and distribution of water (including desalting of sea water to produce water as the principal product of interest, and excluding system operation for agricultural purposes and treatment of waste water solely in order to prevent pollution). It corresponds to division 41 (NACE/ISIC). Deliveries of water from one public supply undertaking to another are excluded.

**Self-supply:** abstraction of water by the user for own final use.

**Other supply:** the part of water supply to agriculture which was not included under 'Public water supply' or 'self supply' (that means all system operations for agricultural irrigation which are not individual irrigation systems). This might also include some water from self-supply distributed to other users

**Waste water:** water which is of no further immediate value to the purpose for which it was used or in the pursuit of which it was produced because of its quality, quantity or time of occurrence. However, waste water from one user can be a potential supply to a user elsewhere.

**Waste water treatment:** a process to render waste water fit to meet applicable environmental standards or other quality norms for recycling or reuse. Three broad types of treatment are distinguished: primary, secondary and tertiary.

**Urban waste water:** domestic waste water or the mixture of domestic waste water with industrial waste water and/or run-off rain water.

**Urban waste water collecting system:** a system of conduits which collects and conducts urban waste water. Collecting systems are often operated by public authorities or semi-public associations.

**Urban waste water treatment:** all treatment of waste water in urban waste water treatment plants (UWWTP's). UWWTP's are usually operated by public authorities or by private companies working by order of public authorities. Includes waste water delivered to treatment plants by trucks.

**Independent waste water collecting system:** individual private facilities installed to evacuate domestic and other waste water in cases where an urban collecting system is not available or not justified because it would either produce no environmental benefit or involve excessive cost.

**Other waste water treatment:** treatment of waste water in any non-public treatment plant, i.e. industrial waste water treatment plants (IWWP). Excluded from 'other waste water treatment' is the treatment in septic tanks.

**Independent treatment:** systems of collection, preliminary treatment, treatment, infiltration or discharge of domestic waste water from dwellings generally between 1 and 50 population equivalents, not connected to an urban waste water system. Examples of such systems are septic tanks. Excluded are systems with storage tanks from which the waste water is transported periodically by trucks to an urban waste water treatment plant. These systems are considered to be connected to the urban waste water system.

**Primary treatment:** treatment of (urban) waste water by a physical and/or chemical process involving settlement of suspended solids, or other process in which the BOD<sub>5</sub> of the incoming waste water is reduced by at least 20% before discharge and the total suspended solids of the incoming waste water are reduced by at least 50%.

**Secondary treatment:** treatment of (urban) waste water by a process generally involving biological treatment with a secondary settlement or other process, resulting in a BOD removal of at least 70% and a COD removal of at least 75%.

**Tertiary treatment:** treatment (additional to secondary treatment) of nitrogen and/or phosphorous and/or any other pollutant affecting the quality or a specific use of water: microbiological pollution, colour etc. This treatment results in an organic pollution removal of at least 95% for BOD and 85% for COD and/or a nitrogen removal of at least 70% and/or a phosphorus removal of at least 80% and/or a microbiological removal.

**Waste water treatment plant:** installation to render waste water, sludge, storm water or cooling water fit to meet applicable environmental standards or other quality norms for recycling or reuse.

**Sewage sludge:** the accumulated settled solids separated from various types of water either moist or mixed with a liquid component as a result of natural or artificial processes.

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For the purpose of this publication, some groupings have been made as follows:

**Member States:** Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden and the United Kingdom.

**Candidate Countries:** Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Malta, Poland, Romania, the Slovak Republic, Slovenia, Latvia, Lithuania and Turkey.

**EFTA (European Free Trade Association) countries:** Iceland, Switzerland and Norway.

**Nordic countries:** Finland, Sweden, Iceland and Norway.

**Southern countries:** Cyprus, Greece, Italy, Malta, Portugal, Spain, Slovenia and Turkey.

**Western countries:** Belgium, Germany, Denmark, France, Ireland, Luxembourg, Austria, the Netherlands, Switzerland, and the United Kingdom.



# Further information:

## ➤ Databases

NewCronos, theme 8, milieu, water  
theme 3, demo, dpop, ppavg

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## For information on methodology

Ulrich Wieland, Eurostat/F3, L-2920 Luxembourg, Tel. (352) 4301 33644, Fax (352) 4301 30039, E-mail: [ulrich.wieland@cec.eu.int](mailto:ulrich.wieland@cec.eu.int)

Véronique Sondag carried out the data processing and statistical analysis.

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