

## *Germany*

The European Commission and the OECD jointly review investment needs and financing capacities for water supply, sanitation and flood protection in each of the European Union's 28 member countries<sup>1</sup>. A fact sheet was developed for each country. Each fact sheet: (i) highlights the main drivers of future expenditure and quantifies projected investment needs; and (ii) analyses past sources of financing as well as capacities to finance future needs.

The analysis reflected in the fact sheets aims to support cross-country comparisons. For some indicators, trade-offs had to be made between reporting the most up-to-date and accurate data for each individual country and using data available for all countries in order to support such cross-country comparisons. The fact sheets were reviewed by country authorities and have been revised to reflect comments as much as possible. Inaccuracies on selected items may remain, which reflect discrepancies between national and international data sources.

A full methodological document will be published to explain in detail the sources, categories and methods used to produce estimates. In a nutshell:

- Current levels of expenditure (baseline) on water supply and sanitation are based on a range of data sets from Eurostat, which combine water-related public and household expenditures.
- Projections on future expenditures for water supply and sanitation are driven by the growth in urban population. Additional scenarios for water supply and sanitation were developed to factor in such drivers such as compliance with Drinking Water Directive (DWD), Urban Wastewater Treatment Directive (UWWTD) and emerging EU water directives.
- The paucity of data on current levels of flood protection expenditures did not allow for monetisation of projected future investment needs. Projections of growth rates of future expenditures for flood protection combine estimates of exposure of population, assets and GDP to risks of coastal or river floods.
- The characterisation of past sources of financing in each country is derived from baseline data on current levels of public and household expenditures, debt finance and EU transfers.
- Countries' future financing capacities are approximated by analysing room for manoeuvre in 3 areas: i) the ability to raise the price of water services (taking into account affordability concerns); ii) the ability to increase public spending; and iii) the ability to tap into private finance. Affordability analysis is based on water-related household baseline expenditures, not on average tariffs (which are highly uncertain, inaccurate and not comparable across countries).

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<sup>1</sup> Further information and project outputs can be found on the websites of the European Commission and the OECD.

The future costs of diffuse pollution, compliance with the Water Framework Directive, adaptation to climate change, contaminants of emerging concern, urban floods from heavy rains, as well as the potential of innovation to minimise future financing needs are explored qualitatively and will be reflected separately. Costs related to water storage and bulk water supply are not considered.

### Key messages

- High-level of expenditure per capita translate into very high compliance rates with the requirements of the EU DWD and UWWTD and high performance of networks.
- Regular river flooding results in significant direct damage costs. Climate change is expected to increase storm-related protection needs on the Baltic and North Sea shores.
- Germany does not face any core issue in terms of financing capacity. Current price levels demonstrate the ability to recover costs of WSS services.

### Context

Germany is a wealthy country, although future economic growth is expected to rank among the lowest in the EU. The population is expected to grow slightly until 2040, and decline afterwards, while Germany's urbanisation rate is expected to increase from 75 to about 83% by 2050. According to the Federal Agency for Nature Conservation<sup>2</sup>, farmland accounts for over 50% of the country's total area, forests about 30%. All other land use categories account for less than 10% each with the largest ones being built-up land and transport infrastructure. Inland waters represent less than 2.5%.

Germany's water resources are relatively abundant, although there are shortages in some regions due to low groundwater levels and high demand from industry. However, annual water abstraction per capita has been regularly decreasing and is well below the OECD Europe average (OECD, 2012<sub>[3]</sub>).

Table 1 presents a number of key indicators characterising the country context and features relevant to future expenditures for WSS and flood protection. These indicators are further discussed in the next sections, including those that underpin the projections of future investment needs.

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<sup>2</sup> <https://www.bfn.de/en/service/facts-and-figures/the-utilisation-of-nature/land-use-overview/land-use-in-germany/alternative-text-for-the-figure.html>

**Table 1. Key features relevant to future expenditures for WSS and flood protection**

	Indicator	Value (rank if applicable)	Data Source	Year
<b>Economy and Demographics</b>	GDP per capita	EUR 38 200 (8/28)	Eurostat	2016
	Projected GDP growth	1.4% (27/28)	IMF	2016-2022
	Projected urban population variation by 2050	1.1x (15/28)	UN	2017-2050
<b>Water Supply and Sanitation</b>	Estimated annual average expenditure per capita	EUR 290	Authors based on Eurostat	2011-2015
	Population not connected	0.7%	EC	2015
	Annual household consumption per capita	46 m3	Eurostat	
	Leakage rate for public water supply	12%	EC	2017
	Non-revenue water	c6%	EurEau	2017
	Compliance with UWWTD Art.3, 4 and 5 (Index)	99.9% (3/28)	EC	2014
<b>Flood Protection</b>	Estimated annual average expenditure per capita	EUR 3	EC survey	2013-15
	Pop. potentially affected in flood risk areas	22%	EC report	2015
	Value of assets at risk (rise 2015-30):	1.22x (8/28)	WRI	2015-2030

Note: Rank 1 implies best in class among the EU member countries for which data is available for each indicator.

## Main drivers and projections of future investment needs

### *Water supply and sanitation*

Thanks to high level of WSS-related expenditure per capita, Germany performs well on network performance and connection for water supply and sanitation. The country reaches very high rates of compliance with microbiological, chemical and indicator parameters laid down in the Drinking Water Directive (99-100%) (European Commission, 2017<sub>[1]</sub>). Germany is among the top 3 European Union member countries in terms of compliance with the Urban Water Treatment Directive, with 100% of waste water collected and 99.9% of it being subject to secondary treatment (European Commission, 2017<sub>[1]</sub>). Germany fully complies with the requirements of Article 5(4) of the Directive on more stringent treatment; wastewater treatment plants achieve removal of 81% of nitrogen and 90% of phosphorus (UBA, 2014<sub>[2]</sub>)

Despite these high rates of compliance with the DWD and UWTD, continued efforts are still needed to bring access to wastewater treatment in eastern Länder fully up to western Länder levels (OECD, 2012<sub>[2]</sub>). Further, while water pricing combined with strict regulations have been effective in reducing consumption, this poses unforeseen issues; for instance, sewers occasionally have to be flushed with injected drinking water in order to prevent stagnation of raw sewage (WWF, 2017<sub>[3]</sub>). As decreased water consumption and increased efficiency remain desirable, this is, however, a problem, which water supply and wastewater companies can more efficiently solve than consumers.

Table 2 projects future investment needs in water supply and sanitation for a business as usual and a compliance scenario. The compliance scenario consists of two dimensions (1) investments needed to comply with the revised DWD, extend access to vulnerable populations and improve network efficiency (reduce leakage); and (2) investments needed to comply with the UWWTD.

**Table 2. Water supply and sanitation: projected investment needs to 2050 (million EUR)**

GERMANY		Baseline 2015	2020	2030	Total by 2030	2040	2050
<b>BAU water supply and sanitation</b>	<b>CAPEX</b>	13598	14272	14960	-	15453	15701
	<b>TOTEX</b>	23383	24413	25367	-	25977	26168
<b>Scenario Compliance + for water supply and sanitation</b>	<b>ADD. CAPEX</b>	-	2047	2076	22734	-	-
	<b>ADD. TOTEX</b>	-	3678	3700	40204	-	-
Compliance with DWD, access and efficiency (water supply)	ADD. CAPEX	-	116	116	1160	-	-
	ADD. TOTEX	-	376	376	3757	-	-
Compliance with UWWTD (sanitation)	ADD. CAPEX	-	1931	1960	21575	-	-
	ADD. TOTEX	-	3303	3324	36447	-	-

*Note:* BAU projections on future expenditures for water supply and sanitation are estimated based on the growth in urban population. Additional scenarios for water supply and sanitation are based on drivers relating to compliance the DWD and UWWTD as well as (for water supply) the cost of connecting vulnerable groups and of reduced leakage. The projections do not take into account the age and pace of renewal of water supply and sanitation assets due to the lack of comprehensive and comparable data across EU member countries.

*Source:* OECD analysis based on Eurostat (water-related public and household expenditure data) for the baseline; United Nations and Eurostat (total and urban population statistics and projections); European Commission (estimates of costs of compliance with revised DWD and of connecting vulnerable groups, leakage rates, and distance to compliance with UWWTD).

The effect of other drivers of future WSS-related investments could not be projected, due to lack of comparable data. This is for instance the case of investment needs relating to new contaminants resulting from micro-pollutants in water, which is in turn likely to increase the costs of wastewater treatment. As one of the Baltic Coastal Countries, Germany has agreed to develop measures to address micro-plastics and urban and storm water discharges to rivers, as well as to consider cost-effective mitigation measures to reduce legacy pollutants and contaminants of emerging concern, including pharmaceuticals (HELCOM, 2018<sup>[3]</sup>).

### ***Flood risk management***

Germany is hit regularly by floods resulting in significant direct damage costs. The estimated direct costs of the 11 major floods recorded between 2002 and 2013 reach EUR 34 billion. The Elbe flood in August 2002, for example, caused damages amounting to EUR 11 billion. In response, Germany has plans for significant investments in controlled (polders) and uncontrolled (dyke relocations) retention measures in the coming years and decades under its National Flood Protection Programme.<sup>3</sup>

<sup>3</sup> <http://www.bmu.de/P3572>

The Federal Ministry of the Environment has developed a climate change adaptation strategy (German Federal Government, 2008<sub>[6]</sub>). Storm speed and surges along the Baltic and North Sea coasts are expected to increase, which will require expanded coastal protection by the end of the 21st century. Decreased rainfall in the summer, combined with temperature rise, is expected to affect agricultural production, especially in south-west Germany and parts of the eastern Länder. Tourism will also be affected.

Table 3 highlights growth factors in future investment needs for protection against (riverine and coastal) flood risks. The increase in the value of assets at risk from future river flood events is higher than in other countries, at around 22% more in 2030 relative to 2015.

**Table 3. Protection against coastal and river flood risks: projected growth rates of investment needs to 2030**

	Expenditures to protect against river flood risk			Expenditures to protect against coastal flood risk
	Total growth factors, by 2030			Categories (1-4), by 2030
	Expected urban damage	Expected affected population	Expected affected GDP	
<b>Germany</b>	1,76	1,34	1,70	3

*Note:* It was not possible to establish a robust baseline of current expenditures for flood protection due to the absence of comprehensive and comparable data across EU member countries. As a result, this table presents projected growth rates in future expenditures.

*Source:* OECD analysis based on the Aqueduct Global Flood Analyzer of the World Resources Institute (river flood impacts by urban damage, affected GDP, and affected population), the global database of FLOOD PROtection Standards (for countries river flood-related protection level), the European Commission Joint Research Centre (change of build-up in areas vulnerable for coastal flooding), a study 2010 by Hinkel et al, (number of people exposed to coastal flooding, and damage costs in the case of a coastal flood event).

### ***Other pressures affecting compliance with WFD***

Only 16% of natural surface water bodies achieve a good or high ecological status and 5% of heavily modified or artificial water bodies achieve a good or high ecological potential. 86% of surface water bodies, 90% of heavily modified and artificial water bodies and 63% of groundwater bodies achieve good chemical status. 96% of groundwater bodies are in good quantitative status (European Commission, 2017<sub>[5]</sub>).

The main pressure on German surface waters is flow regulation and hydromorphological alteration that affect 79% of surface water bodies (European Commission, 2017<sub>[5]</sub>). The implementation of measures to reduce hydromorphological pressure in river basins is, therefore, likely to induce costs and investments.

Nitrates from agricultural sources pollute groundwater. Diffuse sources of pollution affect 75% of groundwater bodies, point sources 28% (European Commission, 2017<sub>[5]</sub>). In this context, excessive nutrient loads (Section 2.2) and, as highlighted above, micro-pollutants (e.g. pharmaceuticals) are considered growing threats (OECD, 2012<sub>[3]</sub>).

## **Past financing strategies and room for manoeuvre to finance future needs**

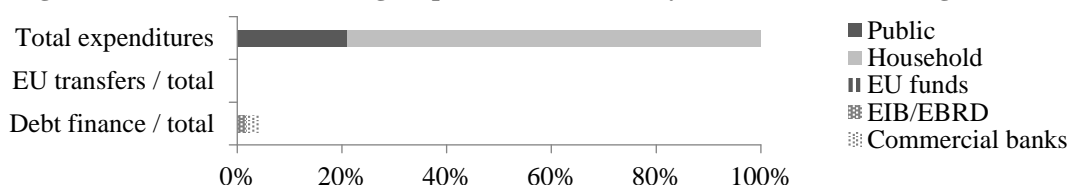
### ***Water supply and sanitation***

Water supply is a mandatory duty of the state, with the operational responsibility lying with municipalities. There are over 6 000 water utilities in Germany. Among these, the share of

private companies has increased to represent more than 40% in number and over 60% of volumes of drinking water supplied (UBA, 2014<sub>[8]</sub>).

As highlighted in Figure 1, Germany relies heavily on pricing (household expenditures) to finance WSS-related upfront capital expenditures and operational expenses. Effective water pricing according to the polluter-pays principle has been a core feature and enabler of the development of Germany's comprehensive and high-quality water supply and wastewater services. Past concerns about insufficient transparency in setting water tariffs, potential inefficiencies of water utilities, and the related impacts on relatively high water prices (OECD, 2012<sub>[6]</sub>) have been addressed by water companies. The need to recourse to debt finance during the period 2011-2015 appears minimal. Further, the country has not benefited from - nor would have been in need of - EU transfers.

**Figure 1. Share of annual average expenditure on WSS, by source (2011-15 average, %)**



Source: Eurostat (for public and household expenditures), European Commission (for EU transfers), European Investment Bank, IJ Global, Thomson Reuters, Dealogic (for debt finance).

Based on criteria in Table 4, Germany does not face any core issue in terms of financing capacity. Current levels of water pricing demonstrate the ability to raise and maintain tariffs towards full cost recovery of WSS services. Should higher levels of public spending be needed at some point, the authorities would likely be in a position to rely on borrowing.

**Table 4. Indicators of future financing capacities**

	Indicator	Value (rank)	Year	Data Source	Assessment
<b>Ability to price water</b>	Water expenditures in lowest household income decile	2.3% (19/26)	2011-15	Authors based on Eurostat	High
	Full cost recovery equivalent in lowest household income decile	2.9% (14/28)	2011-15	Authors based on Eurostat	
	At-risk-of-poverty rate	16.5% (15/28)	2016	Eurostat	
<b>Ability to raise public spending</b>	Tax revenue / GDP	39.8% (20/28)	2016	Eurostat	High
	Government consolidated debt / GDP	68.1% (15/28)	2016	Eurostat	
	Sovereign rating	AAA	2017	Standard & Poor's	
<b>Ability to use debt finance</b>	Domestic credit to private sector / GDP	78% (15/28)	2015	World Bank	High

### *Flood risk management*

Following a mapping of flood risks, some Länder have invested in the management and prevention of floods by using nature-based infrastructures as part of regional programmes supported by the EU structural funds (European Commission, 2017<sup>[1]</sup>). In response to a survey by the European Commission, Germany indicated an annual average investment in flood protection of about EUR 230 million for the period 2008-2013, based on data reported by the länder to the federal government (European Commission, 2017<sup>[6]</sup>).

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