

Croatia

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 countries¹. 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).

¹ 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

- Croatia faces significant challenges in financing expansion of water supply, sewerage, wastewater treatment and flood protection infrastructure to meet the requirements of the EU water directives.
- Affordability of water supply and sanitation tariffs remains a concern for poor households and limits Croatia's ability to raise tariffs. In addition, non-revenue water is high (44%)
- Croatia is hit regularly by flooding events (river, pluvial and coastal) with serious economic damage costs. Climate change will increase the severity and frequency of extreme flood events.

Context

Croatia's economic output per inhabitant is among the lowest in the EU, although the economy is expected to grow at an above-average rate over the coming years. Croatia is moderately urbanised, with around 60% of its current population living in urban areas. Urbanisation is forecast to grow to 70% over the next thirty years (UN, 2017). At the same time, its total population is expected to steadily decrease.

Given it is the most recent member of the EU (joining in 2013), there is a lack of historical reporting and data on Croatia's compliance with EU Directives.

Croatia has relatively high levels of water availability across its territory, which is split into two main river basins, the Danube and the Adriatic. The Danube drains over 66% of mainland Croatia, home to nearly 68% of the population (RBMP 2016-2021). Rainfall scarcity in the dryer summer months causes periods of significantly lower flows. Conversely, periods of high precipitation have led to major flooding events (EC, 2017). Water quality is adversely impacted by nutrient run-off into surface waters, particularly in the Danube River Basin (Danube Water Program, 2015). Croatia faces challenges with connection to water supply and sanitation services and with water quality.

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.

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

	Indicator	Value (rank if applicable)	Data Source	Year
Economy and Demographics	GDP per capita	EUR 11 100 (25/28)	Eurostat	2016
	Projected GDP growth	2.3% (13/28)	IMF	2016-2022
	Projected urban population variation	1.07x (20/28)	UN	2017-2050
Water Supply and Sanitation	Estimated annual average expenditure per capita	EUR 90	Authors based on EUROSTAT	2011-2015
	Population not connected to public water supply	14.5%	EC	2015
	Annual domestic sector consumption per capita	n.a.	EUROSTAT	
	Leakage rate for public water supply	44%	EC	2017
	Non-revenue water	n.a.	EurEau	2017
	Compliance with UWWTD Art.3, 4 and 5 (Index)	n.a.	EC	2014
Flood Protection	Estimated annual average expenditure per capita	EUR 22	EC survey	2013-15
	Population potentially affected in flood risk areas	n.a.	EC report	2015
	Value of assets at risk (rise 2015-30):	0.3x (1/28)	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

Having joined the European Union in 2013, Croatia has committed to implement the EC's water directives by 2023, which will require substantial investments to extend and upgrade existing ageing water supply, sewerage and wastewater treatment infrastructure (Danube Water Program, 2015).

Croatia was not accounted for in the latest reporting exercise of the DWD because of the recent Accession to the EU. The latest reporting by WHO and UNICEF (2017) indicate that in 2015, 90% of Croatia's population had access to safely managed drinking water and 100% had access to piped water supply. However, the drinking water network is ageing (>50 years in most places) and suffers from high leakage rates (c. 40%) (Danube Water Program, 2015). Furthermore, there are concerns with drinking water quality; Croatia benefits from a transitional measure to comply with the DWD regarding microbiological and indicator parameters for a number of water supply zones (EC, 2017).

Substantial improvements are needed to comply with the UWWTD. In 2015, a large proportion of the population (40%) did not have access to safely managed sanitation services (WHO and UNICEF, 2017). The estimated investment needs (reported by Croatia under Article 17 of the UWWTD Directive) to reach full compliance with the UWWTD are EUR 2880 million (EC, 2017). Additional investment in wastewater treatment may be required in

small communities (servicing <2000 people) if health risks related to wastewater pollution are identified (i.e. contamination of drinking water, bathing water and shellfish) (EC, 2017).

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)

CROATIA		Baseline 2015	2020	2030	Total by 2030	2040	2050
BAU water supply and sanitation	CAPEX	185	192	212	-	232	251
	TOTEX	394	390	402	-	412	418
Scenario Compliance + for water supply and sanitation	ADD. CAPEX	-	97	98	1055	-	-
	ADD. TOTEX	-	198	190	2097	-	-
	TOTEX	-	-	-	-	-	-
Compliance with DWD, access and efficiency (water supply)	ADD. CAPEX	-	17	17	173	-	-
	ADD. TOTEX	-	36	36	363	-	-
	TOTEX	-	-	-	-	-	-
Compliance with UWWTD (sanitation)	ADD. CAPEX	-	79	81	882	-	-
	ADD. TOTEX	-	162	154	1734	-	-
	TOTEX	-	-	-	-	-	-

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).

Flood risk management

Croatia is hit regularly by flooding events (river, pluvial and coastal) with serious economic damage costs. Since 2010, flood damage costs of EUR 298 million have been reported. Total aid granted to Croatia from the EU Solidarity Fund since 2010 is EUR 22.79 million (EC, 2017).

The government has developed River Basin Management Plans and Flood Risk Management Plans, in accordance with its obligations under the Water Framework Directive and Floods Directive. The risk of flooding is concentrated in about 15% of the land area (WWF, 2018). Current protective measures rely on flood storage in lowland areas, with embankments and ‘room for the river’ providing protection in the Danube basin.

The evolution of flood risks will depend on climatic scenarios, with increasing periods of drought contributing to less frequent occurrence of smaller flood events, but potentially increasing the risks of less common, higher impact floods (WRI, 2015).

Table 3 highlights growth factors in future investment needs for protection against (riverine and coastal) flood risks. Urban floods from heavy rains will be discussed separately (not in

the country fact sheet). The increase in the value of assets at risk from river flood events is lower than in other countries, although this remains an important source of future risk.

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	
Croatia	1,20	0,86	1,19	Na

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 factors in future expenditures. A growth factor is defined as the factor by which current flood risk expenditures should be multiplied in order to maintain current flood risk protection standards in the future (by 2030). For coastal flood, countries were classified in one of four categories of projected coastal flood risk investment needs, in which 1 indicates very low growth of projected investment needs and 4 very high growth of projected investment needs by 2030.

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 (Scussolini et al., 2016) (for countries river flood-related protection level), the European Commission Joint Research Centre (change of build-up in areas vulnerable for coastal flooding), a 2010 study by Hinkel et al. (number of people exposed to coastal flooding, and damage costs in the case of a coastal flood event).

Other selected pressures affecting compliance with the WFD

In 2015, about 61% of natural water bodies and 19% of modified/artificial water bodies meet the standard of ‘good ecological status’ required by the EU WFD (EC, 2017). Good chemical status and good quantitative status is achieved in over 80% of groundwater bodies (EC, 2017).

Diffuse source pollution affects 94% of water bodies and is the main source of non-compliance with water quality standards (EC, 2017). Point source pollution impacts about one-quarter of water bodies. River management and hydromorphological changes negatively affect 30-40% of rivers.

Groundwater provides approximately 90% of Croatia’s drinking water, with the remainder drawn from rivers and reservoirs (WWF, 2018). As such, protection of aquifers is vital. Direct discharge into groundwater is prohibited, but commonly occurs into surface waters.

Past financing strategies and room for manoeuvre to finance future needs

Water supply and sanitation

Water supply and sanitation services are managed by local government, who operate through public utility companies. The 2010 Water Act has contributed to ongoing consolidation amongst the utility companies; 17% of the population is served by one company, Zagreb Waterworks (Danube Water Program, 2015).

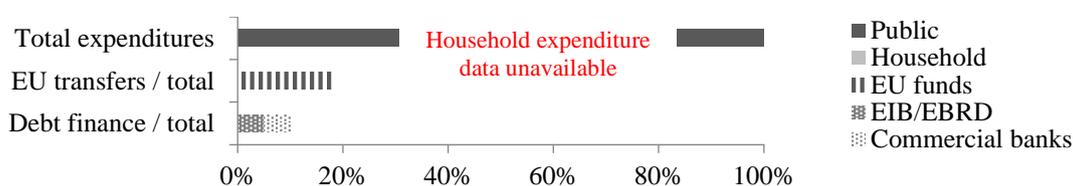
Households connected to water supply and sanitation infrastructure typically pay tariffs, in line with the principle of full-cost recovery, although subsidies exist when charges exceed a price cap relative to household income (Danube Water Program, 2015). Despite this, affordability remains an issue for poor households. Poor households in Croatia are much more likely to spend a significant proportion of their annual budget on water supply and

sanitation services than non-poor households; 17% of Croatian households in the bottom quintile spend more than 3% of annual expenditure on water supply and sanitation services (WHO and UNICEF, 2017). Cross-subsidisation occurs from industrial to residential users, with industrial tariffs as much as 50% larger in some instances (Danube Water Program, 2015).

Non-revenue water accounts for as much as 44% of water supplied, which reflects both distribution losses and water supplied free of charge for policy reasons. Although it is difficult to make direct cross-country comparisons, this performance lags behind the average of most other EU countries (Danube Water Program, 2015; EurEau, 2017).

As per Figure 1 (NB: data on water-related household expenditures is not available), EU transfers have played a significant role in supporting domestic public spending. The provision of debt by European multilateral banks and commercial banks highlights trust in the financial sustainability of at least some projects.

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).

Table 4 indicates that Croatia faces financing challenges, in particular due to affordability concerns if tariffs were to increase. The country also has limited ability to attract private finance.

Table 4. Indicators of future financing capacities for water supply and sanitation

	Indicator	Value (rank)	Year	Data Source	Assessment
Ability to price water	Water expenditures in lowest household income decile	N/A	2011-15	Authors based on EUROSTAT	Medium
	Full cost recovery equivalent in lowest household income decile	4.02% (21/28)	2011-15	Authors based on EUROSTAT	
	At-risk-of-poverty rate	19.5% (20/28)	2016	EUROSTAT	
Ability to raise public spending	Tax revenue / GDP	37.9% (16/28)	2016	EUROSTAT	Medium
	Government consolidated debt / GDP	82.9% (19/28)	2016	EUROSTAT	
	Sovereign rating	BB	2017	Standard & Poor's	
Ability to attract private finance	Domestic credit to private sector / GDP	65% (17/28)	2015	World Bank	Medium

Flood risk management

Croatia does not currently compile figures on flood protection expenditures.

After the 2014 floods, Croatia requested a EUR 40 million loan from the Council of Europe Development Bank (CEB) for the implementation of the “Flood Projection Project”, targeting specifically the populations living in the high risk areas of the Danube and Adriatic River Basins. The Project is 50:50 co-financed by the CEB and public revenue raised from the collection of water contributions and a water regulation fee (Hrvatske vode, n.d.).

A more strategic approach to flood risk reduction is needed in Croatia to ensure that environmental impacts are duly considered and that Flood Risk Management Plans are coordinated with River Basin Management Plans. The use of natural water retention measures should be prioritised to deliver environmental, social and economic benefits. There are some good examples of the use of natural solutions in Croatia. For instance, the largest floodwater retention area in the Central Sava Basin (located in Lonjsko Polje Nature Park), utilises the value of natural floodplains and wetlands to store the floodwaters of the Sava River (EC, 2017).

References

- Hrvatske vode (n.d.), Flood protection project funding <https://www.voda.hr/en/ceb/flood-prevention-project-funding> (accessed 8/02/2019).
- Danube Water Program (2015), Water and Wastewater Services in the Danube Region, Croatia Country Note. http://sos.danubis.org/files/File/country_notes_pdf/SoS_Croatia.pdf
- European Commission (2017), EU Environmental Implementation Review Country Report - Croatia. http://ec.europa.eu/environment/eir/pdf/report_hr_en.pdf.
- European Environment Agency (2017a), Croatia Land Cover 2012 <https://www.eea.europa.eu/themes/landuse/land-cover-country-fact-sheets/hr-croatia-landcover-2012.pdf/view>.
- European Environment Agency (2017b), Climate Change Impacts and Vulnerability in Europe 2016, An Indicator-Based Report.
- European Federation of National Water Services (EurEau) (2017), Europe's Water in Figures, 2017 Edition.
- Eurostat (2017), Land use overview by NUTS 2 regions.
- OECD (2017), *Groundwater Allocation: Managing Growing Pressures on Quantity and Quality*, OECD Studies on Water, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264281554-en>.
- OECD (2016), *Financial Management of Flood Risk*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264257689-en>
- OECD (2013), *Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264200449-en>.
- Who and UNICEF (2017), *Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines*. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), Geneva.
- World Resources Institute (2015), *Aqueduct Global Flood Analyzer*. <http://www.wri.org/resources/maps/aqueduct-global-flood-analyzer>.
- World Wildlife Fund (2018), *Water Risk Filter Country Profiles*. <http://waterriskfilter.panda.org/en/CountryProfiles>.
- UN Department of Economic and Social Affairs, Population Division (2017), *World Population Prospects: The 2017 Revision*. <https://esa.un.org/unpd/wpp/>.