WATER GLOBAL PRACTICE

Is the UWWTD Implementation Delivering Results for the People, the Economy, and the Environment of the Danube Region?

A wastewater management assessment based on the World Bank's engagement

DECEMBER 2018

WORLD BANK GROUP

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Notes

1. Stjepan Gabric can be contacted at sgabric@worldbank.org.
2. See the Danube Water Program's website: www.danube-water-program.org.

Executive Summary

This note takes stock of the World Bank experience with wastewater management changes under the European Union (EU) water policies in the Danube River Basin (DRB) since the early 1990s, considering environmental, economic, sustainability, and affordability aspects. This review highlights the significant challenges that the EU member and candidate countries face during their alignment with the Urban Wastewater Treatment Directive (UWWTD) and underlines the opportunities that lie ahead to optimize the implementation of the Directive. The review focuses on seven new member states: Bulgaria, Croatia, the Czech Republic, Hungary, Romania, the Slovak Republic, and Slovenia, and includes Austria as an older member state mostly for comparative purposes. It is complemented by a more detailed underlying study conducted by Umweltbundesamt et al. (2017).[1]

While this review is limited in scope and resources, one of its intention is to spur a debate and further research and discussion—building on the World Bank's regional experience—and to identify issues worthy of further attention and more in-depth analysis. To do so, the following key questions are explored:

- *What are the main issues related to wastewater management in the Danube region?*

  The region faces a different reality than many old EU member states. After the collapse of socialist regimes in Eastern Europe, market forces had a dramatic impact on socioeconomic trends in the Danube region. Overall population is decreasing in most countries, in particular in rural areas. Industrial activities have been significantly reduced, and the intensively cultivated agriculture area drastically cut, all of which have contributed to significantly lower pollution load and reduced pressure on water quality. Further, the overall level of economic development is far behind that of older EU member states, leaving a more limited disposable income at household and national levels. Those conditions mean that the Danube region faces a wastewater management and environmental situation that is significantly different from that of some of the older EU member states that initially drove the design of the UWWTD.

  At the fall of communism, countries of the Danube region faced unequal levels of wastewater collection and treatment, and wastewater management took second stage given the economic and political transformation of the early 1990s. The wastewater agenda became a priority again during the EU accession and membership phase given its significance in the EU environmental acquis, leading to mobilization of very large financial resources (primarily from EU funds) in the largest ever investment cycle in wastewater infrastructure that the Danube region has ever seen.

  The main environmental problem in the DRB consists of a serious eutrophication of the Black Sea that largely derives from the severe industrial, urban, and intensive agriculture pollution in the Danube watershed during the socialist era. The poor state of water in the Black Sea led the countries, under the auspices of the International Commission for the

Protection of the Danube River (ICPDR), to classify most of the DRB as a sensitive area in 2007, triggering requirements for more stringent wastewater treatment under the UWWTD Article 5.

- *Is the region achieving EU wastewater policies' objectives?*

  As a result of wastewater management efforts over the past 15 years, all countries of the DRB have witnessed major improvements in levels of wastewater treatment but falls behind implementation schedule. Since EU expansion in Eastern Europe in 2004, the share of wastewater treated according to the UWWTD requirements among the DRB's new EU member states continues to rise, and is now reaching 79 percent, with significant variations between countries. Although this evolution shows that a major improvement has been achieved, the new EU member states from the DRB are still lagging behind the EU-28 average when it comes to UWWTD requirement fulfillment, and almost all new EU member states of the region are facing major delays in meeting UWWTD requirements. The time allocated to new EU member states for transitioning toward UWWTD compliance was almost universally underestimated by national governments during negotiations, leading to noncompliance within the negotiated time frame, and triggering potential infringement procedures.

  The continuous improvement of surface water quality in the Danube region can be only partly attributed to the implementation of EU wastewater policies. The surface water quality of the Danube river has noticeably improved over the last 20 years for both organic pollutants and nutrients. However, this improvement is only partially derived from UWWTD implementation. UWWTD is not the only policy instrument that helps improvement of surface water quality; others, such as the Nitrates Directive and the recent Industrial Emission Directive, have also contributed. The application of source apportionment revealed that, as expected, UWWTD agglomerations are responsible for only part of the total nitrogen and phosphorus emissions into the DRB. Major decreases in industrial activity, reductions in the use of mineral fertilizers, closures of large livestock farms (significant point sources of agricultural pollution) in the early 1990s—and the general depopulation in the region since the 1990s—have significantly contributed to improved surface water quality.

- *Do the countries have the financial capacity to achieve and maintain EU compliant wastewater management?*

  A total of €42.5 billion has been invested by the seven new EU member states of the Danube region, plus Austria, to implement the UWWTD. An additional €57 billion will be needed to reach and maintain full compliance until 2040, out of which €17 billion would fund new investment in noncompliant agglomerations above the 2,000 population equivalent (PE), and €40 billion would fund reinvestment needs for older infrastructure renewal from 2015 to 2040. This means that even after UWWTD compliance is achieved, new infrastructure renewal and reinvestment are expected, requiring a very significant investment for full, longer term UWWTD compliance. Given the size of the needed investments,

even if a significant portion of wastewater infrastructure investment were continued to be financed through EU funds, all new EU member states would have to mobilize significant additional funds, either from taxes or tariffs, in the next few decades to bridge the investment gap and remain compliant with the UWWTD.

- *Do the countries have the technical and institutional capacity to achieve and maintain EU compliant wastewater management?*

  Technical and institutional capacity enhancement is crucial for successful wastewater project implementation. One of the main bottlenecks for UWWTD implementation has been the lack of institutional capacity of the implementing utilities, given the size and complexity of investment projects. The tendering process has also proved difficult and challenging and has generated important delays. A lack of established mechanisms to fund equity contributions for the project beneficiaries presents a serious barrier in some countries. Slow responsiveness, lack of knowledge and of information exchange, and transfer between different levels of governance and responsibility have had negative impacts on project identification and have significantly slowed investment preparation and implementation. Local construction markets have not been able to quickly respond to the sudden, significant increases of investment levels, leading to limited competition and higher costs. The challenges faced have shown that most new EU members have not managed to conduct the necessary institutional reforms or adjustments to prepare for an exceptionally large infrastructure investment cycle, resulting in low absorption of available funds and delays in UWWTD compliance.

- *Is EU compliant wastewater management affordable for the utility companies and the people of the region?*

  Total cost recovery (TCR) achievement is a challenge in most countries of the region. Operation and maintenance (O&M) costs in the Danube region are essentially financed through tariff revenues with either no or minimal subsidies provided by national or local governments. In general, with the exception of Austria, current tariffs in the studied countries are not sufficient to ensure TCR of actual wastewater services (including depreciation for future investment and reinvestment). Bringing wastewater management in compliance with EU wastewater policy brings a range of benefits, but also significantly increase O&M costs of utilities, triggering wastewater tariff increases that will continue in the future. These necessary long-term tariff increases to improve operational cost recovery ratio will almost certainly trigger affordability issues for the bottom 40 percent (B40) of the population. The situation will be much more challenging for EU candidate countries, who will have to increase tariffs (or taxes) much more significantly to meet EU *acquis*[2] despite lower levels of economic development.

- *Is EU compliant wastewater management implemented in an economically efficient manner?*

  The challenges highlighted previously raise the question of economic justification of the UWWTD implementation in the Danube region. While further work is needed to reach a

more robust conclusion, assessment conducted under this study, on the basis of limited literature review and available evidence, shows no compelling self-standing economic case to support full compliance with the Directive in the Danube region. However, the UWWTD is an important environmental legislation that provides an equal level of aquatic environmental protection among EU member states, and levels the field to access the European single market. Therefore, it should not be primarily seen as a measure that yields a positive economic cost-benefit ratio by itself. This makes it all the more important to ensure that the Directive is implemented in the most economically efficient manner to maximize its cost-benefit ratio.

- *Recommendations*

  For Directive implementation: Optimizing the economic efficiency of UWWTD implementation could be achieved by using cost-effective analysis to **prioritize investments for the most impactful projects with regard to fulfilling the objectives of the Water Framework Directive (WFD)**. Efforts should then gradually move toward projects with lower environmental impact using cost-benefit analysis. Using solid economic appraisals could help improve investment efficiency while maintaining environmental benefits and WFD objectives achievement. In addition, more efforts are needed to increase wastewater service provision efficiency. Adopting a regional approach—following the WFD River Basin Management Plan—to better plan and manage wastewater infrastructure could lead to economies of scale, better efficiency, and minimized costs of service provision. In addition, member states should explore possibilities to increase benefits from UWWTD implementation through the promotion of reuse and circular economy.

  The positive impact created by massive UWWTD-driven investments can be preserved and further enhanced only if service quality levels are sustained or improved. If system operation and reinvestment are not financially sustainable, there is a risk of decline in service quality and deterioration of quality of discharges into receiving waters. Hence the issue of UWWTD investment sustainability needs to be addressed through a clear costing of wastewater treatment plant (WWTP) projects, including lifecycle and long-term costs and funding planning. Because the financing gaps between tariff revenues and total costs of wastewater services already exist in several new member state countries, there should be an effort to strengthen the financial viability of utilities to ensure financial sustainability. Finally, affordability issues deriving from UWWTD implementation need to be tackled. UWWTD implementation requires substantial investments, which result in an operating expense (opex) increase. This leads to tariff increases, which trigger affordability issues to be addressed through targeted subsidies for the poorest part of the population as well as provision of basic sanitation services for vulnerable and marginalized groups.

  For candidate countries: Most of the current and potential candidate countries are far from compliant with the UWWTD. They face significantly lower economic development levels than EU member states, further constraining their ability to fund the needed investments.

Facing such challenges and learning from the experience of the new EU member states of the Danube region, candidate countries should **prepare a strategic financing plan for wastewater infrastructure compliance well in advance of accession negotiations**. During the accession process, they should **negotiate an appropriate deadline to implement the UWWTD**, taking into account the economic affordability and sustainability of this costly piece of EU environmental legislation.

For the evaluation of the Directive: Achieving WFD environmental objectives in the most cost-efficient way should be the key priority of the EU's water and wastewater policies, and this should guide the UWWTD review process. The UWWTD is a relatively simple directive, requiring only limited data and modeling and planning capacity for its implementation, in contrast, for example, to the Water Framework Directive. Therefore, member states know exactly what is excepted from them, and the progress can be easily tracked, ensuring a good level of enforcement. At the same time, this simplicity does not provide much space for policy makers and planners to adjust requirements according to the specificity of each situation, which might be significantly different from the one for which the Directive was initially designed. Giving more flexibility to member states to optimize their urban wastewater policies could offer ways to improve the economic efficiency of the UWWTD implementation. For instance, alternative measures to the ones mandated in the UWWTD could be allowed if they are proven to be more cost effective in terms of reaching WFD environmental objectives while safeguarding public health. In rural areas or small settlements, just above 2,000 PE, some flexibility could be given to local utilities to adopt measures such as green infrastructure or nature-based solutions[3] that could be well adapted to their issues, be less costly, and prove financially sustainable. Exceptions to the Directive requirements could be considered when no clear environmental or health benefit derives from the UWWTD implementation. For instance, if the economic costs of a project are higher than its benefits, lower levels of wastewater treatment could be considered as long as the proposed investment option is cost-effective and WFD goals are achieved.

Notes

1. See Umweltbundesamt's website: http://www.danubis.org/eng/sector-resources/technical-topics/wastewater-management-and-treatment/.
2. The *acquis* is the body of common rights and obligations that is binding on all the EU member states.
3. The International Union for Conservation of Nature defines nature-based solutions as "actions to protect, sustainably manage, and restore natural or modified ecosystems [and] that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."

Abbreviations

B40	bottom 40 percent
BOT	build-operate-transfer
BOD_5	five-day biochemical oxygen demand
Capex	capital expense
COD	chemical oxygen demand
DRB	Danube River Basin
DRBMP	Danube River Basin Management Plan
DWP	Danube Water Program
EC	European Commission
EEA	European Environment Agency
EIRR	economic internal rate of return
ENPV	economic net present value
E-PRTR	European Pollutant Release and Transfer Register
ERC	environmental and resource costs
EU	European Union
GoB	government of Bulgaria
ICPDR	International Commission for the Protection of the Danube River
ICR	Implementation Completion and Results report
IED	Industrial Emission Directive (2010/75/EU)
IWRM	Integrated Water Resource Management
MS	member state
N_{tot}	total nitrogen
NH_4-N	nitrogen content of the ammonium ion
NO_3-N	nitrate nitrogen
OCR	operation cost recovery
OECD	Organisation for Economic Co-operation and Development
O&M	operations and maintenance
Opex	operating expense
P_{tot}	total phosphorous
PE	population equivalent
PIU	project implementation unit
PO_4-P	phosphate phosphorous
PPP	purchasing power parity
PWU	public water utility

RBMP	River Basin Management Plan
SOP	sustainability orientated pathway
TCR	total cost recovery
UWWTD	Urban Waste Water Treatment Directive (91/271/EC)
WFD	Water Framework Directive (2000/60/EC)
WSS	water supply and sanitation
WWTP	wastewater treatment plant

Chapter 1 Introduction

Wastewater management is key to ensure environmental preservation of water bodies, improve health and hygienic living conditions of populations, and support economic development. As such, it generates important positive environmental and socioeconomic externalities. This note takes stock of 25 years of wastewater management under the European Union (EU) water policies (box 1.1) in the Danube River Basin (DRB), considering environmental, economic, sustainability, and affordability aspects. It builds extensively on the World Bank's experience in wastewater management in the region,[1] as well as a series of recent Bank-led analytical pieces (Umweltbundesamt 2017; World Bank 2018; World Bank and Danube Water Program 2015), and several World Bank implementation completion reports capturing the Bank's experience on wastewater management in the EU member and candidate countries in the region. This note is also informed by a regional stakeholder workshop on wastewater management with the International Commission for the Protection of the Danube River (ICPDR) held in Bucharest in December 2017.

This note focuses on Austria, which joined the EU in 1995, and on the seven new EU member states of the DRB located in Central, Eastern, and Southeastern Europe (Bulgaria, Croatia, the Czech Republic, Hungary, Romania, the Slovak Republic, and Slovenia) that have joined the EU between 2004 and 2013 and are still implementing the Urban Wastewater Treatment Directive[2] (UWWTD) in line with harmonization schedules agreed upon during the accession process. The present note incorporates lessons learned from the Bank's experience in working on this agenda with other countries in the region, in particular Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, and Montenegro. This work seeks to contribute to the ongoing European Commission (EC) UWWTD evaluation and help EU member and candidate countries that are facing or will face challenges to harmonizing their legislation with the UWWTD and implementing it in the coming years.

BOX 1.1. EU Wastewater Management Policies

The common drive behind EU wastewater legislation has been environmental protection, with the nature of the directives' requirements gradually evolving from pollutant emission limits (under the Urban Waste Water Treatment Directive [UWWTD]) to overall water bodies' quality achievement (under the Water Framework Directive [WFD]). The EU legal framework on water management is governed by the WFD, adopted in 2000, which is the main instrument for integrated water resource management (IWRM) in Europe. This Directive introduces an environmentally driven, outcome-based approach requiring member states to reach good status on all their water bodies through the implementation of River Basin Management Plans (RBMPs),

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BOX 1.1. continued

thus focusing on water quality standards. To design RBMPs, the WFD introduces the use of economic appraisals, giving member states leeway to select cost-effective and cost-beneficial measures, either curative or preventive, to achieve WFD compliance.

With regard to wastewater management, the WFD is complemented by the UWWTD, which seeks "to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors" by mandating wastewater collection and treatment in urban agglomerations with a population equivalent (PE) over 2,000, and more advanced treatment in places with a PE above 10,000 and in water bodies deemed sensitive. Such more advanced treatment is required to reduce nitrates and phosphorus pollution loads and hence decrease eutrophication.

For the past 25 years, the UWWTD has been seen as key to achieving the objectives of the WFD, although the situation might be different in some of the DRB member states. The UWWTD requirements are considered basic measures under the WFD, and their fulfillment is obligatory but not always sufficient to comply with the WFD. Most older EU member states had to go beyond the mere UWWTD implementation to achieve the required WFD water quality improvement objectives. The Danube region faces a different starting point because of the collapse of agricultural and industrial activities and its lower economic and demographic development, which on their own have led to significant reductions in pollution. In fact, some DRB member states (box 3.1) have exceeded the EU-wide goal of 60 percent of water bodies at good or very good status despite noncompliance with the UWWTD. The UWWTD is not the only instrument that helps improvement of surface water quality, because a set of other EU environmental protection directives deals with reduction of nutrient and industrial pollution of water (e.g., the Nitrate Directive and Industrial Emission Directive).

Notes

1. The full list of countries includes Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, Kosovo, FYR Macedonia, Moldova, Montenegro, Romania, Serbia, the Slovak Republic, Slovenia, and Ukraine.
2. The full title is Council Directive 91/271/EEC concerning urban wastewater treatment (May 21, 1991).

Chapter 2 Status Overview of EU Wastewater Policies Compliance in the Danube Region

The main environmental problem in the region is considered to be a major eutrophication of the Black Sea (box 2.1). This situation largely derives from the severe industrial and intensive agriculture pollution during the socialist era. This period was characterized by a strong urbanization, a lack of environmental sensitivity, and the rapid development of the water supply infrastructure. Because these changes were not followed by adequate wastewater treatment provision, the receiving waters suffered major water quality deterioration. The poor state of water in the Black Sea led the countries, under the auspices of the International Commission for the Protection of the Danube River (ICPDR), to classify most of the Danube River Basin (DRB) as a sensitive area in 2007, triggering requirements for more stringent wastewater treatment under Urban Wastewater Treatment Directive (UWWTD) Article 5. Since then, nitrogen inputs into the Black Sea have been reduced but are still higher than what was observed during the 1960s, while current phosphate inputs appear to be roughly the same as in the 1960s. According to the Black Sea Commission, efforts to reduce discharges from 49 high priority pollution sources, pollution from insufficiently treated wastewater and airborne emissions in all the Black Sea coastal states are beginning to bear fruit, since fewer and less intense algal blooms are being recorded, and total fish catches have increased.

BOX 2.1. Black Sea Eutrophication Status

Serious eutrophication of the Black Sea, and in particular of its coastal waters, was the main driver for introducing a more stringent level of urban wastewater treatment in the DRB. The Black Sea is the world's most isolated sea: it is connected to the oceans via the Mediterranean Sea through the Bosporus, Dardanelle, and Gibraltar straits. The unique ecosystem of the northwestern shelf of the Black Sea is burdened by excessive loads of nutrients and hazardous substances from coastal countries and rivers that enter it—the most important of which is the Danube, followed by the Dniester and the Dnepr. Pollution inputs and other factors have radically changed Black Sea ecosystems since 1960, and seriously threaten biodiversity and the use of the sea for fishing and recreation. In addition to nutrient pollution, other pressures on the Black Sea ecosystems include organic pesticides, heavy metals, incidental and operational spills from oil vessels and ports, overfishing, and invasions of exotic species.

The ecological status of the coastal waters of the Black Sea has improved significantly since the beginning of the 1990s because of reduced nutrient inputs, which has led to reduced eutrophication and fewer algal blooms (phosphorus inputs into the Black Sea were halved compared to the levels of 1990), and recovery of aquatic life forms. However, the most significant improvements were registered in

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BOX 2.1. continued

the first half of the 1990s because of reduced nutrient emissions due to economic changes and decreased agricultural and industrial activities in the region. Since then, there has been only minor improvements, indicating the predominance of diffuse pollution over point source pollution.

While the environmental trends have been favorable, the Danube delta, where the river flows into the Black Sea, is still a eutrophic zone, and the challenge will be to prevent a possible reversal of the existing trend. If industrial and agricultural activities were to increase in countries from the middle and lower regions of the DRB, this could negatively affect the coastal waters of the Black Sea.

All DRB countries have witnessed major improvements in wastewater treatment over the past 15 years. The DRB covers more than 800,000 square kilometers (approximately 10 percent of continental Europe) and extends through the territories of 19 countries, featuring an important socioeconomic heterogeneity. From an unequal but generally low starting point in the 1990s, after political and economic changes in the region, these countries have come a long way to improve their wastewater services and quality of surface waters. Over the past 15 years, wastewater treatment levels have had great improvement (map 2.1) due to the region benefiting from very large investments, mostly financed by European Union (EU) grant funds, but also with substantive co-financing provided by individual countries.

However, despite their progress and efforts, almost all new EU member states of the region face major challenges in meeting UWWTD requirements. The share of wastewater treated according to the UWWTD requirements—in terms of population equivalent (PE) treated at secondary and tertiary levels, and through individual and other appropriate systems—among observed DRB member states since membership in 2004 continues to rise. It is now reaching 79 percent, although with significant variations between countries. While this evolution shows a major improvement, the DRB member states still lag behind the EU-28 average (figure 2.1, panels a and b). Compared to older EU member states, the level of UWWTD compliance is significantly lower in the Danube EU member states, indicating a significant gap for collection (Article 3), secondary treatment (Article 4), and more stringent treatment (Article 5) of wastewater (figure 2.2). However, in comparison, EU candidate countries or perspective candidate countries from the Danube region (Albania, Bosnia and Herzegovina, Kosovo, the former Yugoslav Republic of Macedonia, Montenegro, and Serbia) are even farther behind because urban wastewater is still mainly collected without treatment. In these countries, the overall percentage of the population connected to urban wastewater systems ranges from 35 percent to 59 percent, but most of this collected urban wastewater is not adequately treated.

MAP 2.1. Level of Wastewater Treatment of Agglomerations ≥ 2,000 Population Equivalent in the Danube River Basin for 2011–12

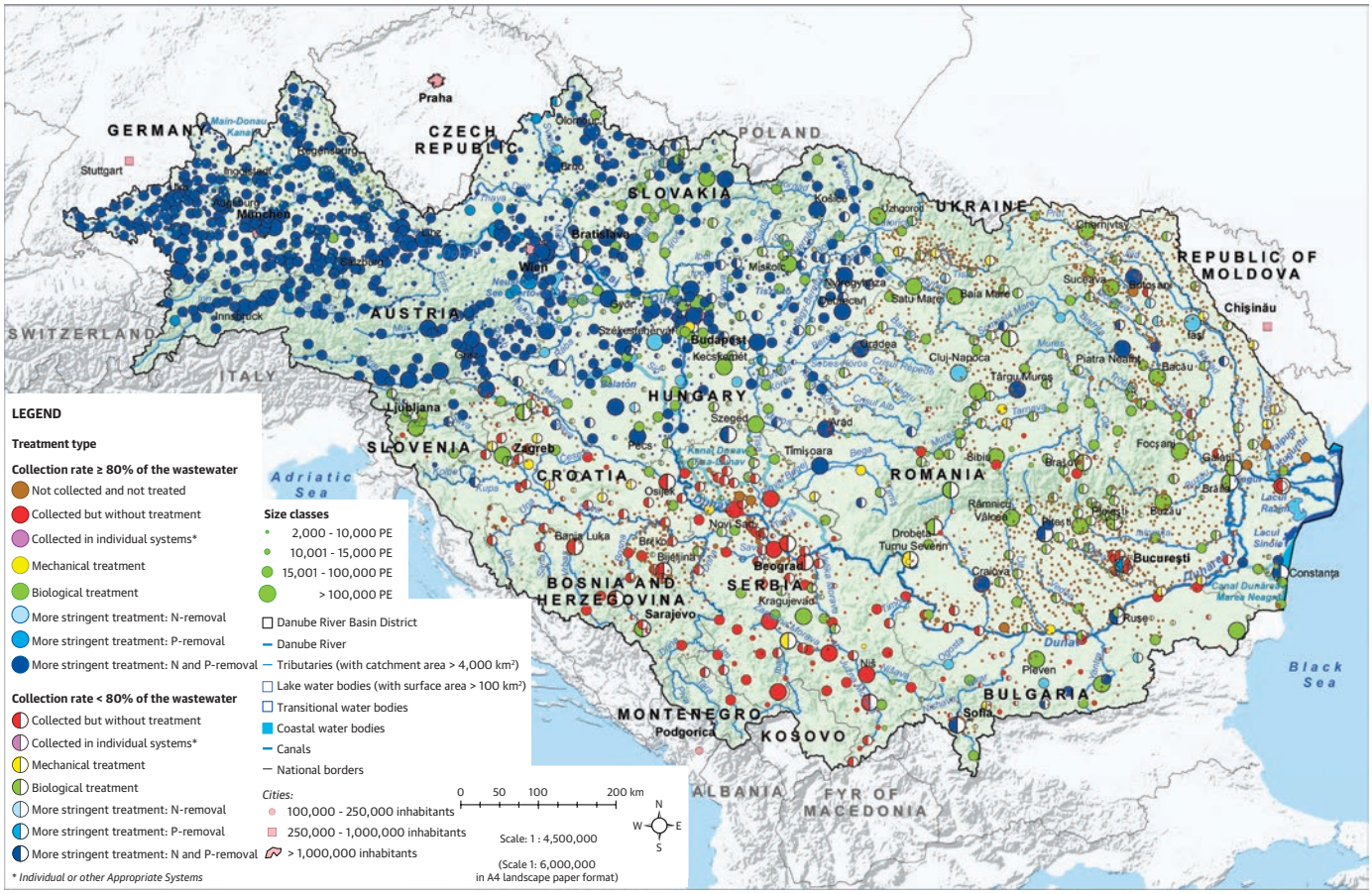
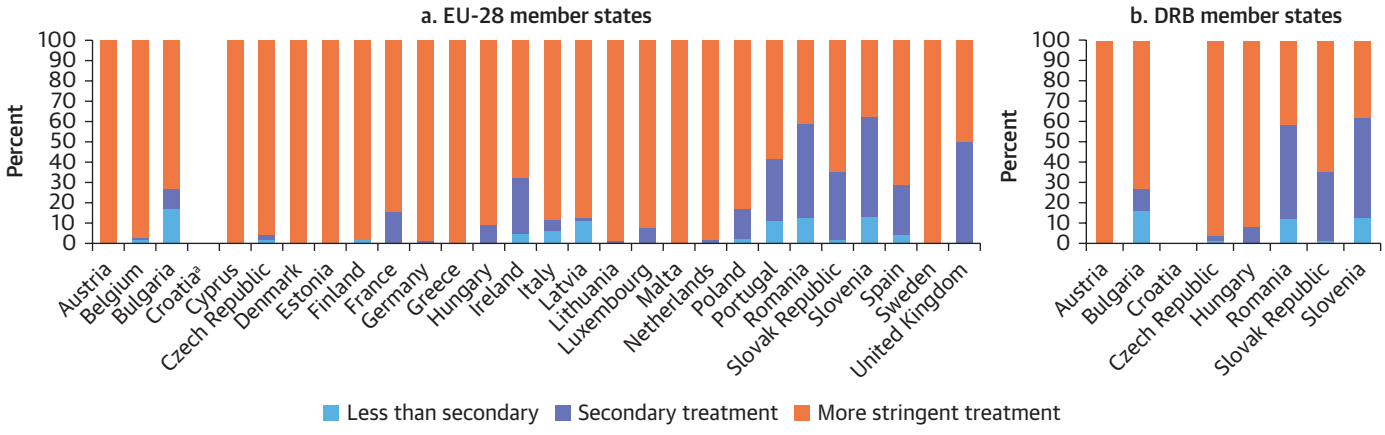


FIGURE 2.1. Share of Collected Load between Treatment Levels for EU-28 Member States and Danube River Basin Member States, 2014

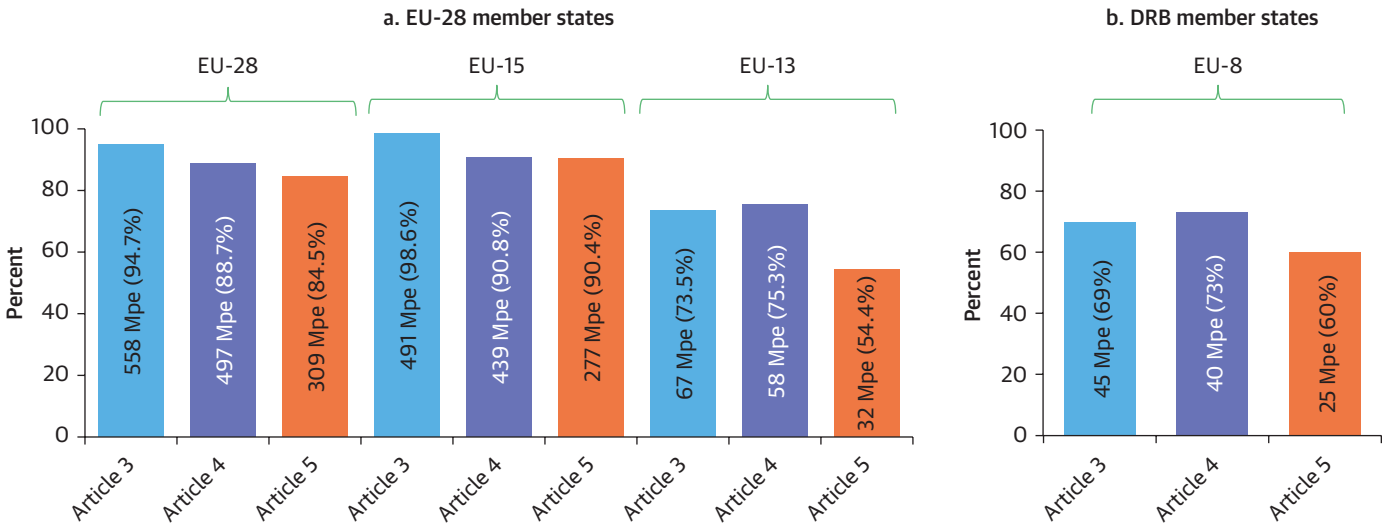


Source: European Commission 2017.

Note: DRB = Danube River Basin; EU = European Union.

a. Since Croatia joined the EU in July 2013 data was not yet available.

FIGURE 2.2. Average Compliance Rates with Articles 3, 4, and 5 of the Urban Waste Water treatment Directive in Relation to Total Subjected Wastewater Load for EU-28 and Danube River Basin Member States, 2014



Source: European Commission 2017.
Note: "Article 3: Member States shall ensure that all agglomerations larger than 2,000 PE are provided with collecting systems for urban wastewater. Where the establishment of a collecting system is not justified either because it would produce no environmental benefit or because it would involve excessive cost, individual systems or other appropriate systems which achieve the same level of environmental protection shall be used. Article 4: Member States shall ensure that urban waste water entering collecting systems shall before discharge be subject to secondary treatment or an equivalent treatment. Discharges from urban waste water treatment plants shall satisfy the relevant requirements provided in Annex of the directive. Article 5: Member States shall ensure that urban waste water entering collecting systems shall before discharge into sensitive areas be subject to more stringent treatment than that described in Article 4, for all discharges from agglomerations of more than 10 000 PE."
DRB = Danube River Basin; EU = European Union; MPE = Million person equivalent.

The time allocated to new EU member states for transitioning toward UWWTD compliance was almost universally underestimated during negotiations, indicating unrealistic assessment of the magnitude of efforts required to achieve compliance. Deadlines for compliance with the UWWTD vary across countries: for EU-15 it was set to December 31, 2005, whereas for new member states from Central and Eastern Europe, staged transitional periods have been agreed upon within individual accession treaties. In principle, however, these transitional periods did not exceed 2015 (except for Romania, in which agglomerations with less than 10,000 PE must comply with the Directive by the end of 2018; and Croatia, which has deadlines between 2018 and 2023). Deadlines have already expired and implementation delays toward full compliance have occurred in all five observed older regional member states (the Czech Republic, the Slovak Republic, Hungary, Slovenia, and Bulgaria) of the Danube region (Table 2.1). It should be also recognized that the original EU-15 had 14 years for compliance (the Directive was adopted in 1991 with a 2005 deadline for EU-15), while this period was 11 years for EU-13, except Romania, with 14 years maximum for less than 10,000 PE. Although pending deadlines still exist for Romania (2018) and Croatia (2023), it is doubtful that they will achieve compliance in due time because of the current annual investment and rate of UWWTD compliance.

TABLE 2.1. Implementation of the Urban Waste Water Treatment Directive (UWWTD) in Danube River Basin Member States

Country	Final deadline for UWWTD implementation	Compliance status		
		Art. 3: collecting system (%)	Art. 4: secondary treatment (%)	Art. 5: more stringent treatment
Austria	2005	0	0	0
Bulgaria	2014	15.8	36.9	87
Croatia	2023	–	–	–
Czech Republic	2010	0	1.4	23.4
Hungary	2015	0	4.6	7.8
Romania[a]	2018	11.2	41.1	75.1
Slovak Republic	2015	0.4	1.7	39.5
Slovenia	2015	4.5	12.3	42.3

Source: 9th UWWTD Synthesis report, 2014.

a. Romania has a transition period with specific rules, and the official agreed compliance presented here is not calculated as for other countries.

BOX 2.2. World Bank Support to Bulgaria in Planning to Achieve UWWTD Compliance

With its accession to the EU in 2007, Bulgaria made commitments to improve the quality of water supply and sanitation (WSS) services to comply with the requirements of the EU's environmental legislation. During the last decade, however, the quality of WSS services in the country increased rather slowly, mainly because of unsustainable political commitment, overreliance on EU funding for the sector, weak enforcement of national environmental regulations, and a chronic shortage of funding due to low WSS tariffs and lack of support from the national budget. This has resulted in a highly undermaintained WSS infrastructure, with high water losses at 57.9 percent, and a low percentage of population with access to wastewater collection (75.5 percent) and wastewater treatment services (62.3 percent),[a] as compared to the DRB average. Consequently, despite a negotiated transition period, Bulgaria failed to meet its accession commitments: compliance with UWWTD for agglomerations over 10,000 PE expired on December 31, 2010, and on December 31, 2014, for agglomerations between 2,000 and 10,000 PE.

In 2012 the government of Bulgaria (GoB) and the World Bank signed a Reimbursable Advisory Services Agreement requesting the Bank's support for the preparation of a Strategy for Development and Management of the Water Supply and Sanitation Sector in the Republic of Bulgaria 2014–2023 (approved by Ministers Council Decision No. 269 of May 7, 2014). The strategy and the action plan for its implementation outlined the necessary reform measures, which can lead the Bulgarian WSS sector

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BOX 2.2. continued

to compliance. The vision of the Bulgarian government is to develop a financially, technically, and environmentally sustainable WSS sector, which would provide quality services at affordable prices to customers, and in accordance with EU environmental legislation. This requires sustainable institutional reform and considerable infrastructure investments over the next decade and beyond.

The GoB and the World Bank cooperation in the WSS sector includes support for strengthening the capacity of the Energy and Water Regulatory Commission and optimizing the cost of compliance with the UWWTD. The Bank has further assisted compliance efforts by helping Bulgaria to optimize compliance costs through the reassessment of agglomeration boundaries to improve the implementation of Directive 91/271/EEC and focus on concentration of population and pollution load rather than using administrative boundaries, as well as introducing cost-effective individual and other appropriate systems.

Delays in the implementation of the sector strategy have led to a new Reimbursable Advisory Services Agreement, in which the World Bank has committed to further supporting of the GoB in the development of a financing strategy, regulatory capacity building, and the increase of service efficiency in the WSS sector. Through this Agreement, the World Bank has also helped the GoB to address the ex-ante conditionality of EU grant funding for the sector through Operational Program Environment 2014–20. Overall, the World Bank assistance to Bulgaria has resulted in the following: (a) preparation of a systematic plan to achieve compliance with UWWTD requirements within a 10-year period; (b) reassessment of agglomerations' boundaries following the Bank guidelines in the current 15 regional feasibility studies, which will reduce the cost of UWWTD compliance; and (c) a proposal to introduce specific funding instruments to support UWWTD implementation, which will allow the GoB to bridge the identified financing gap.

a. NSI data for 2015 for all presented percentage figures.

Chapter 3 Key Questions Regarding Implementation of EU Wastewater Policies

3.1. Is the Region Achieving European Union (EU) Wastewater Policy Objectives?

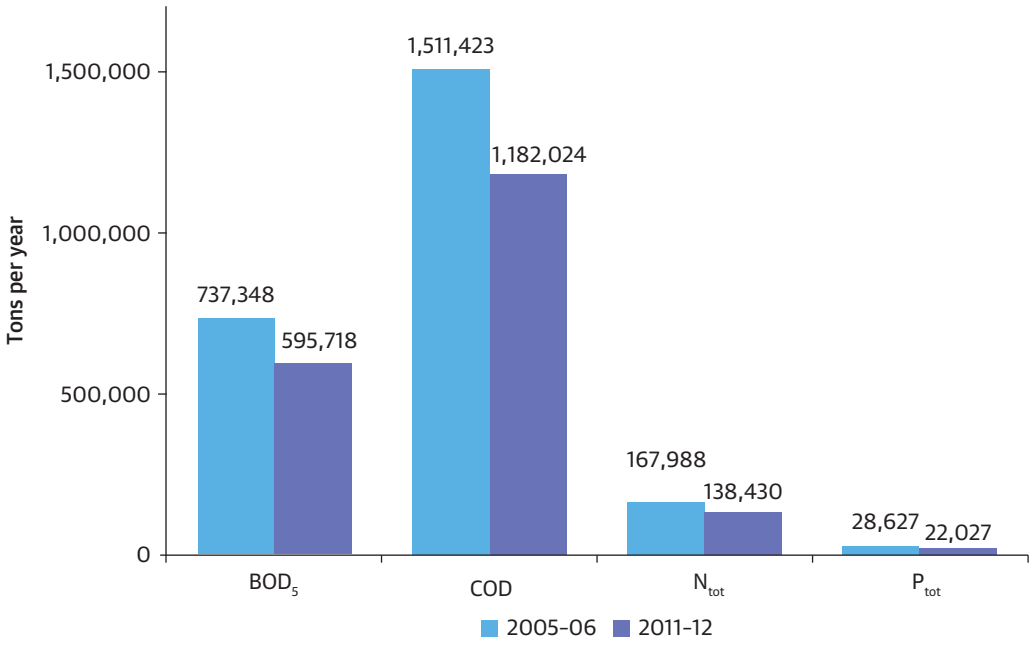
Short answer: The Urban Wastewater Treatment Directive (UWWTD) aims "to protect the environment from adverse effects of waste water discharges from cities and certain industrial sectors" while the Water Framework Directive (WFD) aims for "good status" for all ground and surface waters in the EU. The surface water quality has noticeably improved over the last 20 years for both organic pollutants and nutrients. However, this continuous improvement of water quality and pollution reduction is only partially derived from UWWTD implementation. The application of source apportionment revealed that, as expected, UWWTD agglomerations are responsible for only part of the total nitrogen and phosphorus emissions into the Danube River Basin (DRB), and that other sources of pollution are dominant in different countries of the Danube region.

Emission control from agglomerations has led to a continuous reduction of overall emissions into water bodies. Total emission loads for BOD_5, COD, N_{tot}, and P_{tot} from urban settlements in DRB countries decreased significantly between 2006 and 2012 (figure 3.1). In 2012 the total emissions were 596 kilotons per year for BOD_5 (a decrease of 142 kilotons, or 20 percent, if compared to 2006); 1,182 kilotons per year for COD (a decrease of 329 kilotons per year, or 22 percent); 138 kilotons per year for N_{tot} (a decrease of 30 kilotons per year, or 18 percent); and 22 kilotons per year for P_{tot} (a decrease of 6.6 kilotons per year, or 24 percent).

Since 2006, all DRB countries have managed to decrease their pollutant emissions, corresponding to improved compliance with secondary and tertiary treatment requirements, except for Austria, whose emission levels have remained constant due to reaching UWWTD full compliance by 2005. In 2014, the lowest pollution emissions indicators, such as BOD_5 (below 2 kilograms per population equivalent per year [kg/PE/year]), were achieved by countries which had already achieved more than 90 percent compliance with secondary treatment (Austria, the Czech Republic, the Slovak Republic, and Hungary). Slovenia and Bulgaria, both of which show compliance rates of less than 25 percent (Article 4), reached BOD_5 emission values of 5 kg/PE/year to 7 kg/PE/year, while for Romania (4 percent compliance rate with Article 4), BOD_5 emissions were still over 10 kg/PE/year (figure 3.2, panel a). Mean annual N_{tot} emissions decreased by 45 percent in all countries except the Slovak Republic, whereas mean annual emissions of P_{tot} decreased by 15 percent, to 72 percent, in six out of seven countries investigated (figure 3.3, panels a and b).

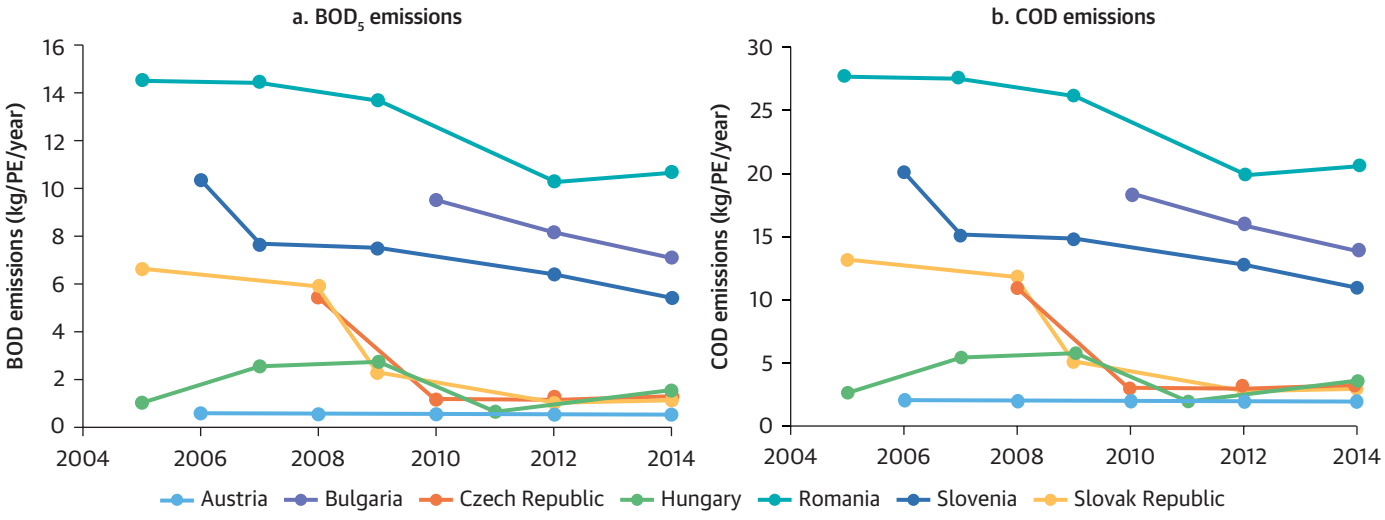
In countries where more than 85 percent of the load in the DRB is treated by secondary treatment (Austria, the Czech Republic, the Slovak Republic, and Hungary), discharges from UWWTD agglomerations contribute only between 0.01 to 0.03 milligrams per liter (mg/l) BOD_5 to BOD_5 concentrations in the Danube (based on measurements taken in 2012).

FIGURE 3.1. BOD_5, COD, N_{tot}, and P_{tot} Emissions from Agglomerations Greater or Equal to 2,000 Population Equivalent in Danube Region, 2005–06 and 2011–12



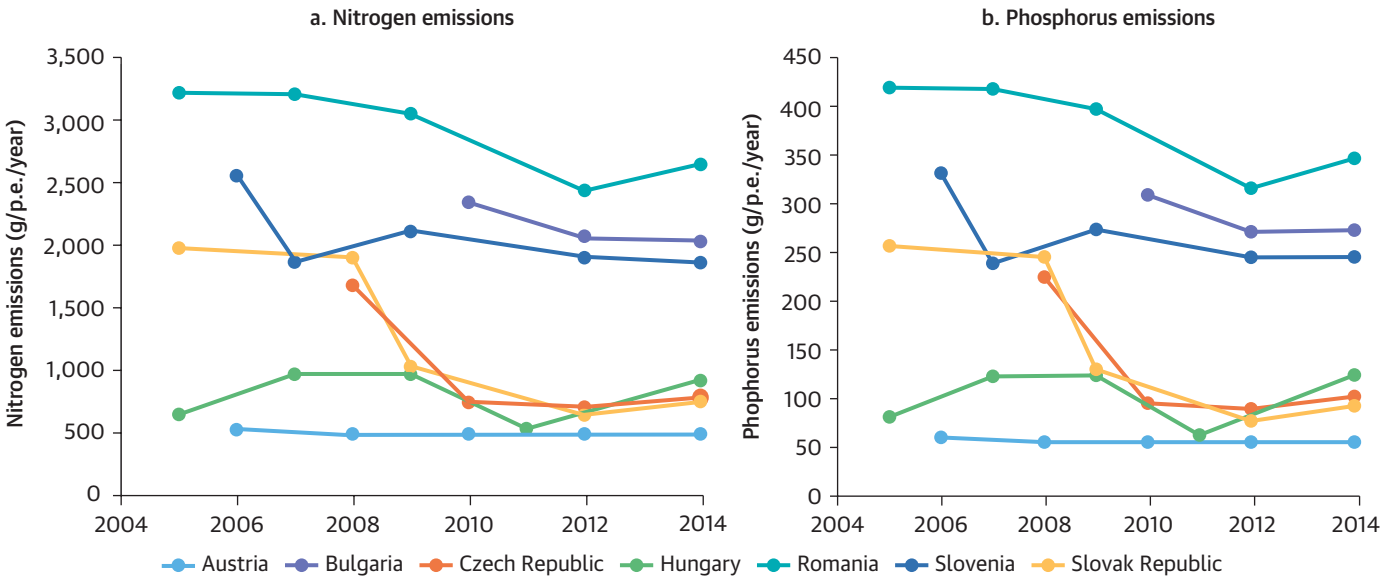
Sources: DRBMP 2009; DRBMP 2015.
Note: BOD_5 = five-day biochemical oxygen demand; COD = chemical oxygen demand; N_{tot} = total nitrogen; P_{tot} = total phosphorous.

FIGURE 3.2. BOD_5 and COD Emission Rates of Danube River Basin Member States, 2005–14



Source: Umweltbundesamt et al. 2017.
Note: BOD_5 = five-day biochemical oxygen demand; COD = chemical oxygen demand; PE = population equivalent.

FIGURE 3.3. Nitrogen and Phosphorus Emissions of Danube River Basin Member States, 2005–14



Source: Umweltbundesamt et al. 2017.
Note: DRB = Danube River Basin; PE = population equivalent.

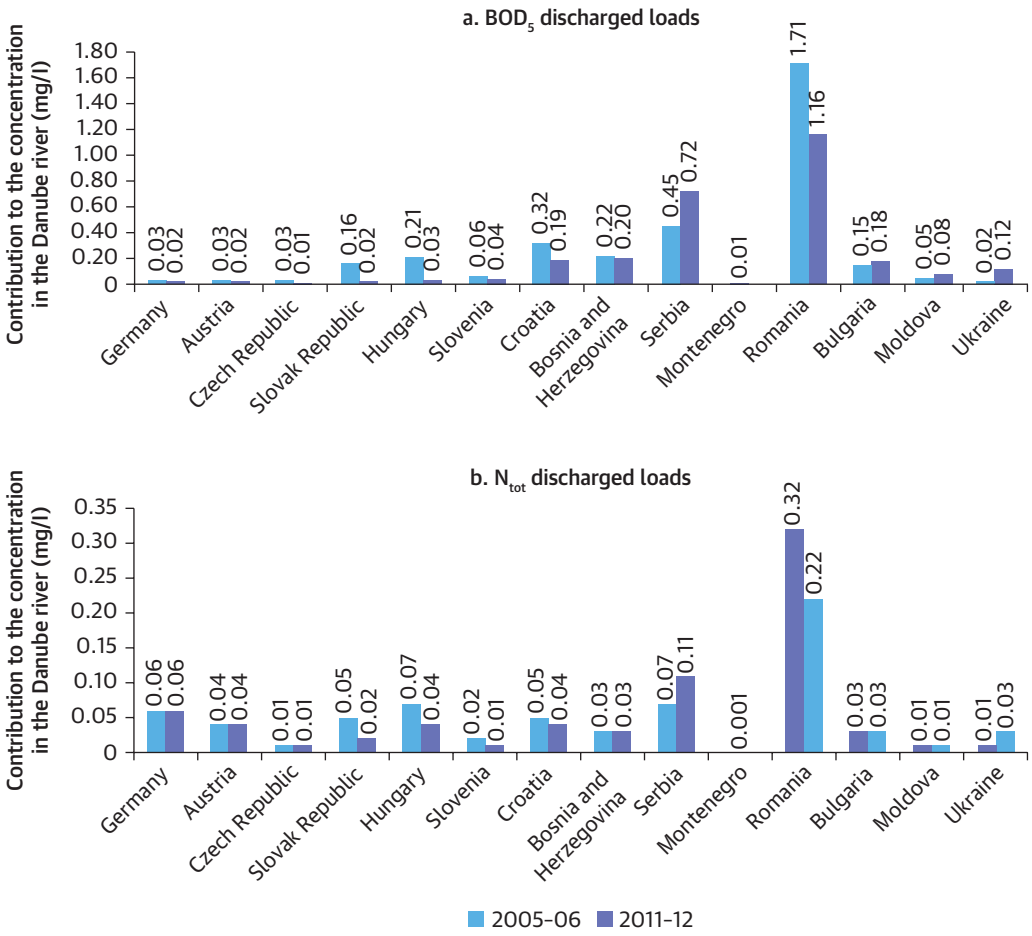
For Slovenia and Bulgaria, where 60 percent to 70 percent of the Danube River Basin's load is treated by secondary treatment, the contribution amounts to 0.04 mg/l (Slovenia) to 0.2 mg/l BOD_5 (Bulgaria). In Croatia and Romania, where around 45 percent of the load in the Danube River Basin is treated by secondary treatment, the BOD_5 contribution amounts to 0.2 mg/l (Croatia) and 1.2 mg/l (Romania).[1]

The surface water quality of the Danube region has noticeably improved over the last 20 years for both organic pollutants (BOD_5, COD) **and nutrients** (N_{tot}, NH_4-N, NO_3-N, P_{tot}, PO_4-P). In most countries investigated, mean annual concentrations in surface waters (calculated as the average of the annual concentration) have decreased over time. As an example, mean annual BOD_5 concentrations dropped by 22 percent to 70 percent in five out of seven countries investigated. NH_4-N concentrations in 26 monitoring stations along the Danube also decreased over time.

The highest decreases are observable in the new EU member states that joined in 2004, 2008, and 2013. Germany and Austria fully implemented the UWWTD by 2005 and have therefore recorded only slight decreases since then. An increase for non-EU member states is also observable and is probably due to the construction of sewer systems without fully operational wastewater treatment plants, resulting in an increased transfer of wastewater discharge from soil to surface water. In Bulgaria, the increase could be due to improved data quality for the reference year 2012 (figure 3.4, panels a and b).

The continuous improvement of water quality and pollution reduction is only partially derived from UWWTD implementation. Indeed, the significant pollutant decrease has actually happened before the decrease in pollution load discharge following EU

FIGURE 3.4. Contribution of Discharged Loads from Agglomerations ≥ 2,000 Population Equivalent to Water Quality in Danube River, 2005–06 and 2011–12



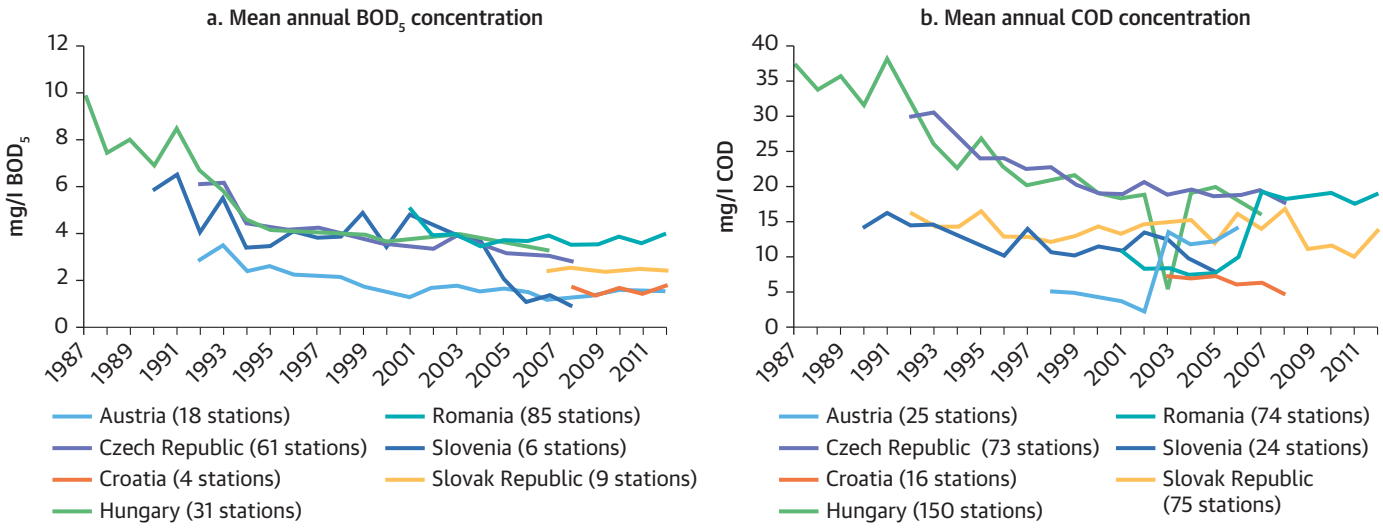
Source: Umweltbundesamt et al. 2017.

Note: BOD_5 = biochemical oxygen demand; N_{tot} = total nitrogen.

membership, because of economic decline in the 1990s (figure 3.5, panels a and b, and figure 3.6, panels a and b). Thus, the quantification of the influence of improved wastewater treatment on enhanced water quality is, indeed, difficult to assess, because wastewater from agglomerations is only partly responsible for the pollution of the aquatic environment. Major decrease in industrial activity, reductions in the use of mineral fertilizers, closures of large livestock farms (significant point sources of agricultural pollution), and general depopulation in the region since the 1990s have all significantly contributed to improved surface water quality.

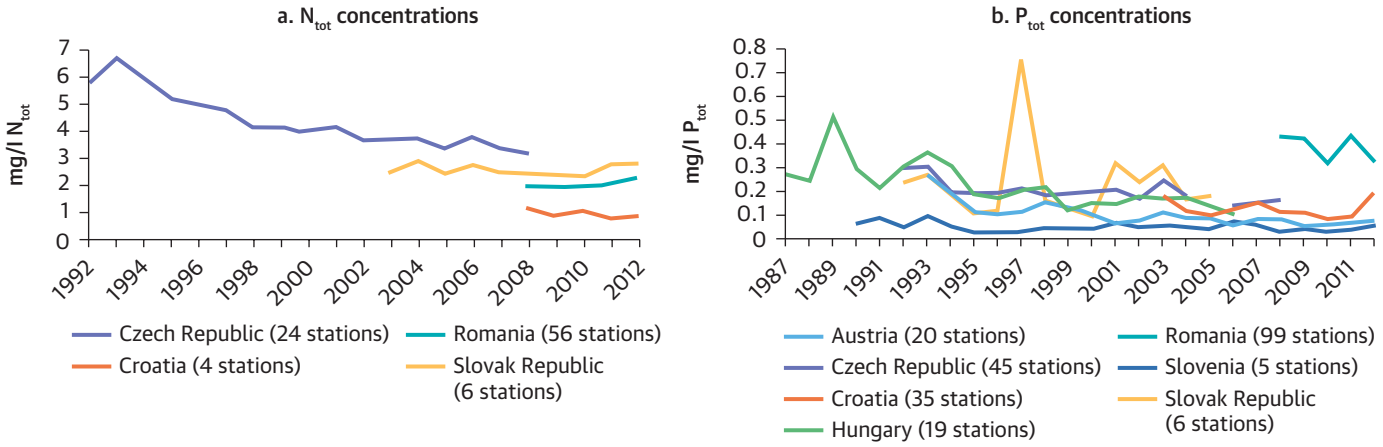
The application of source apportionment reveals that UWWTD agglomerations are responsible for only one part of the total nitrogen and total phosphorus emissions into the DRB, and that other sources of pollution are dominant throughout the Danube region. As defined under the UWWTD,

FIGURE 3.5. Mean Annual BOD_5 and COD Concentrations for Danube River Basin Member States, 1987–2013



Source: Umweltbundesamt et al. 2017.
Note: BOD_5 = biochemical oxygen demand; COD = chemical oxygen demand; stations = measuring stations where water samples are taken and analyzed.

FIGURE 3.6. Mean Annual Concentrations of N_{tot} and P_{tot} for Danube River Basin Member States, 1992–2013



Source: Umweltbundesamt et al. 2017.
Note: N_{tot} = total nitrogen; P_{tot} = total phosphorous.

emissions from agglomerations cover the emissions from combined sewer overflows, unconnected population, urban wastewater treatment plants (WWTPs), and the population connected to sewer systems without treatment plants. For N_{tot}, the pathways' "urban runoff"' and "point sources" amount to only 26 percent of the total nitrogen emissions into the DRB, which means that urban wastewater from agglomerations under the UWWTD is only partly

responsible for nitrogen loads in the surface waters of the DRB. For P_{tot} the pathways '"urban runoff"' and "point sources" amount to 51 percent of the total phosphorus emissions into the DRB, which suggests that measures addressing urban waste management have a potential for reducing those emissions (e.g., by reducing P_{tot} concentrations in detergents and removal of P_{tot} in wastewater treatment plants) (table 3.1).

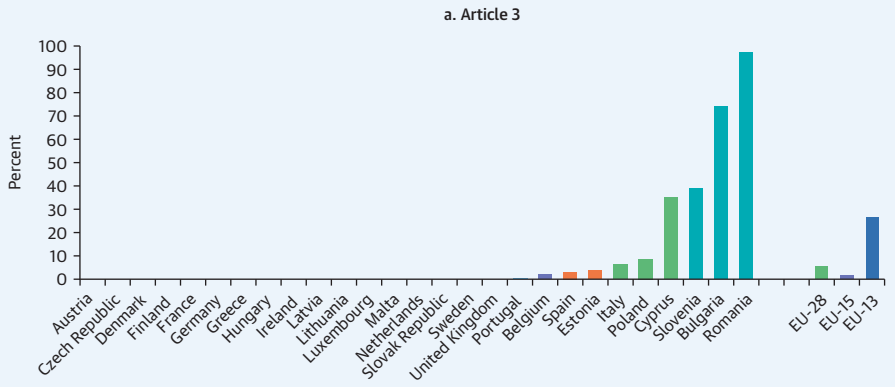
The ecological status of surface water bodies in the eight EU member states of the Danube region show that 27 percent of surface water bodies are affected by pollution pressure, with diffuse sources being the most important (20 percent). Nutrient enrichment causing eutrophication is the most important impact, affecting around 20 percent of the surface water bodies in the countries investigated (figure 3.7).

BOX 3.1. Romania Has Exceeded the EU-Wide Goal Concerning Water Bodies, but Has Very Low UWWTD Compliance

Romania is the worst UWWTD performer among all EU countries. Its rate of legal compliance at agglomerations level was of only 2.6 percent for Article 3; 3.8 percent for Article 4; and 0.9 percent for Article 5 (figure B3.1.1, panels a–c), and its compliance gap remains quite large: 11 percent for Article 3; 41 percent for Article 4; and 75 percent for Article 5 (i.e., the percentage expresses the percentage of load that has still to be addressed adequately).

However, despite this noncompliance situation with regard to UWWTD, Romania has already exceeded the WFD EU-wide goal of 60 percent of good and very good ecological status of water bodies. With two thirds of surface water bodies already achieving good or very good ecological status as of 2016, Romania compares very well within the EU-15. Moreover, it stands out for being the only EU country in which

FIGURE B3.1.1. EU Legal Noncompliance under UWWTD Articles 3, 4, and 5



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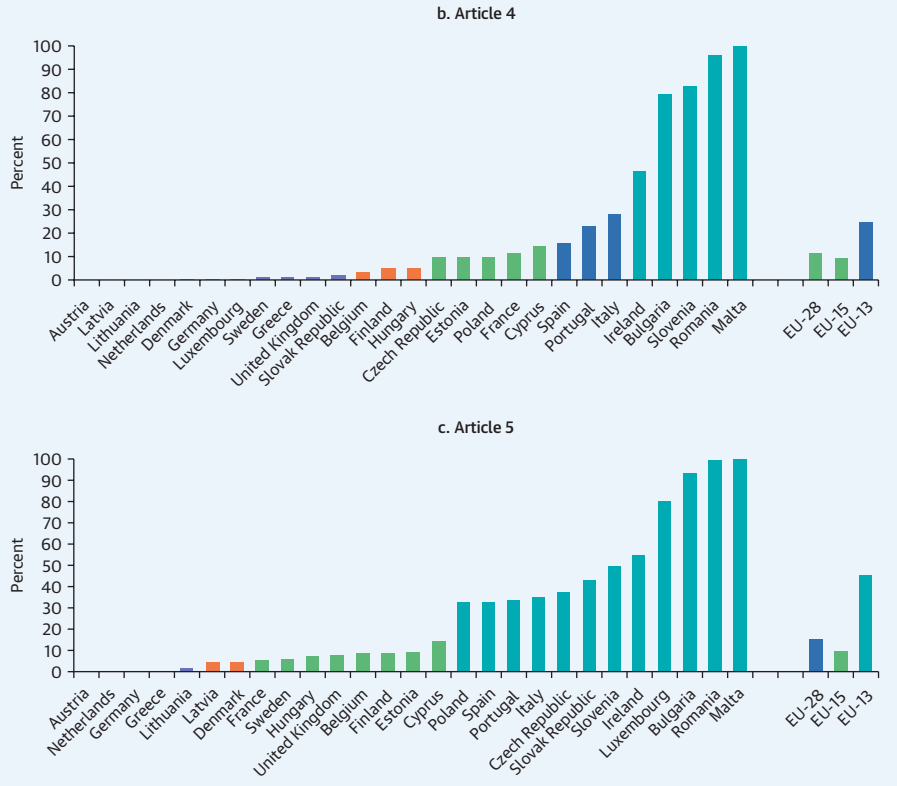
BOX 3.1. continued

FIGURE B3.1.1. continued



Source: World Bank 2018.
Note: EU = European Union; UWWTD = Urban Wastewater Treatment Directive.

the entire territory is reported above 50 percent good ecological status compliance, and less than 30 percent is affected by hydromorphological alterations (figure B3.1.2). While this is largely due to the significant rural population and scarcely populated characteristics of its territory, with little anthropogenic pressures, it still indicates a disconnection between WFD and UWWTD objectives in Romania, and somehow a lack of adaptability of the UWWTD implementation to the specifics of local situations. Romania's case requires additional analysis to fully understand the links between pollution reduction and water status.

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BOX 3.1. continued

FIGURE B3.1.2. Ecological Status and Proportion of Rivers Affected by Hydromorphological Alterations and Diffuse Pollution in EU Member States

Source: EEA 2012.
Note: EU = European Union.

3.2. Do Countries have the Financial Capacity to Achieve and Maintain EU-Compliant Wastewater Management?

Short answer: A total of €42.5 billion has already been invested to implement the UWWTD. However, despite this important investment effort, an additional €57 billion is still needed to reach and maintain full UWWTD compliance until 2040. To fund new investment in non-equipped agglomerations above 2,000 PE, €17 billion is needed, and a further €40 billion to fund reinvestment for older infrastructure renewal from 2015 to 2040. This means that even after UWWTD compliance is achieved, new infrastructure renewal and reinvestment are expected to require a very significant funding to maintain full UWWTD compliance in the Danube region in the longer term, but in a period when EU funding could be expected to decrease. The necessary

TABLE 3.1. Point and Diffuse Nutrient Emissions in the Danube Basin Based on Pathways, 2009–12

Pathway	N_{tot}		P_{tot}	
	Total tons per year	%	Total tons per year	%
Direct atmospheric deposition	12,309	2	301	0.8
Overland flow	49,678	8	602	1.6
Soil erosion	16,665	3	12,169	32
Tile drainage flow	43,694	7	253	0.7
Groundwater flow[a]	325,091	54	5,472	14
Urban runoff[b]	62,226	10	7,129	18
Point sources[c]	95,404	16	12,627	33
Total	**605,067**	**100**	**38,553**	**100**

Source: ICPDR 2015.

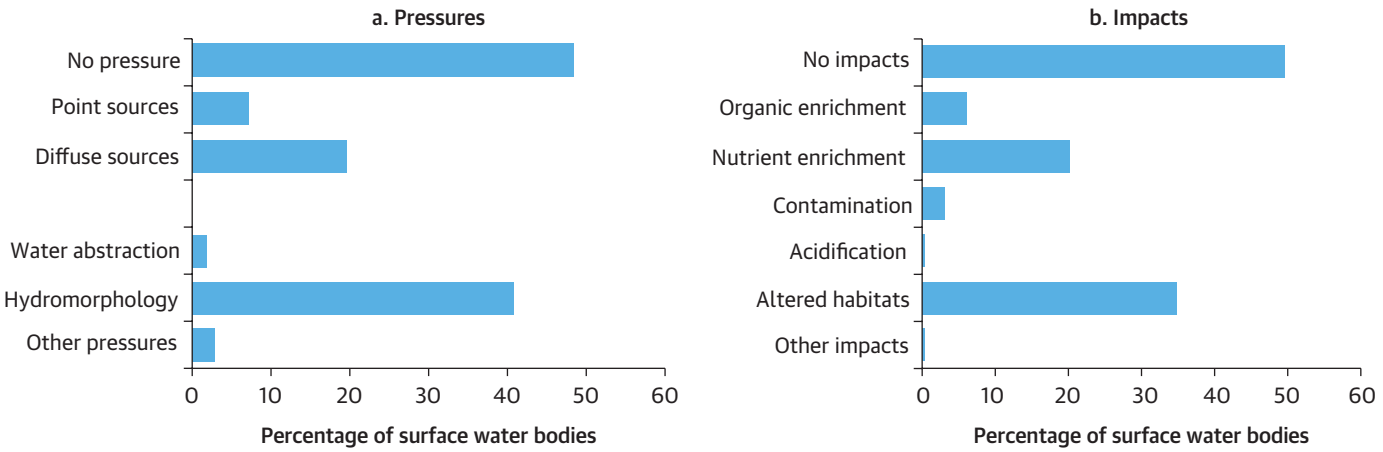
Note: N_{tot} = total nitrogen; P_{tot} = total phosphorous.

a. Summed emissions via all subsurface flow components (base flow and interflow).

b. Summed emissions via urban runoff, combined sewer overflows and not connected population.

c. Summed emissions from urban wastewater treatment plants, population connected to sewer systems without treatment plant and emissions from industrial direct dischargers.

FIGURE 3.7. Share of Pressures and Impacts to Surface Water Bodies in Danube River Basin Member States



Source: Umweltbundesamt et al. 2017.

Note: The eight countries investigated are Austria, Bulgaria, the Czech Republic, Croatia, Hungary, Romania, Slovenia, and Slovak Republic. The total reflects rivers, lakes, transitional waters, and coastal waters.

level of investment—an estimated €2.6 billion per year—would represent a 30 percent increase compared to the past level of investment, and a total of 0.2 percent of gross domestic product (GDP), is still below the level recommended by the Organization for Economic Co-operation and Development (OECD). This change would entail significant increases in either taxes, which might be delicate given the region's fiscal situation, or tariffs, which might be politically or socially delicate. The reality might be even more difficult in regional EU candidate countries that are starting from an even lower base and have lower GDP per capita.

Given the wastewater management starting point in most of the EU member states of the region, a total of €42.5 billion has already been invested to implement the UWWTD. Three-quarters of this amount was spent on sewer networks and the rest on wastewater treatment plants in the eight countries (table 3.2).

However, despite this important investment effort, an additional €57 billion is still needed to reach and maintain full UWWTD compliance (Umweltbundesamt et al. 2017). An additional €17 billion is still needed to fund new investment in non-equipped agglomerations above 2,000 PE (two-thirds for sewers and the rest for wastewater treatment plants). Moreover, to maintain full UWWTD compliance, €40 billion of reinvestment needs for older infrastructure renewal are required from 2015 to 2040 (table 3.3).

This means that even after UWWTD compliance is achieved, new infrastructure renewal and reinvestment is expected to require twice as much funding as the initial investment needed for full compliance in the Danube region (figure 3.8, panels a and b). As a whole, the total future capital expense (capex) demand is roughly estimated at €57 billion for continuous UWWTD compliance up to 2040, which is 30 percent higher than what the DRB member states have spent so far on UWWTD implementation (table 3.4).

The overall investment gap could possibly be increased by €8 billion to €10 billion to cover wastewater management needs in small rural settlements with populations below 2,000 inhabitants. This would amount to €64 billion to €66 billion of a total investment gap to sustain UWWTD implementation up to 2040, which represents €38 per capita per year for the next 25 years, or 0.2 percent of all eight EU member states' GDP (in purchasing power parity [PPP], current US$). This level of spending remains below the OECD recommendation ranging from 0.3 percent to 1.2 percent of GDP (OECD 2011), and as such appears to be feasible. As a comparison, from 1993 to 2013, Austria invested an average of €78 per capita per year in the wastewater sector, which represented 0.13 percent of its GDP (in PPP, current US$). This very high amount equals the funding necessary for the initial achievement of UWWTD objectives. This underlines the heavy financial significance of future renewal and upgrading as a neglected aspect of wastewater management.

TABLE 3.2. Calculated Total Investment Costs Needed for Initial Full UWWTD Compliance among Danube River Basin Member States

Target Countries	Total Pollution load, PE	Historical investment costs €, millions		Future investment costs €, millions		Total investment cost for full compliance €, millions
		Sewer network	WWTP	Sewer network	WWTP	
Austria	20,270,894	10,150	4,238	–	–	14,388
Bulgaria	8,080,245	3,370	810	804	865	5,849
Czech Republic	7,179,593	4,675	1,590	–	21	6,286
Croatia	5,026,227	0	0	3,074	999	4,073
Hungary	10,210,998	5,592	1,221	–	12	6,825
Romania	20,786,160	5,852	990	7,037	3,373	17,252
Slovenia	1,371,002	883	87	112	222	1,304
Slovak Republic	3,890,209	2,360	578	17	281	3,236
Danube Region	**76,815,328**	**32,882**	**9,514**	**11,044**	**5,773**	**59,213**

Source: Umweltbundesamt et al. 2017.

Note: Umweltbundesamt et al. (2017) mentions a total investment need for initial full UWWTD compliance of €17 billion for Romania. However, it should be noted that other sources provide figures varying from €8 billion to €20 billion. PE = population equivalent; UWWTD = Urban Wastewater Treatment Directive; WWTP = wastewater treatment plant; – = not available.

TABLE 3.3. Estimated Reinvestment Needs for Sustained Compliance with UWWTD among Danube River Basin Member States, 2015–40

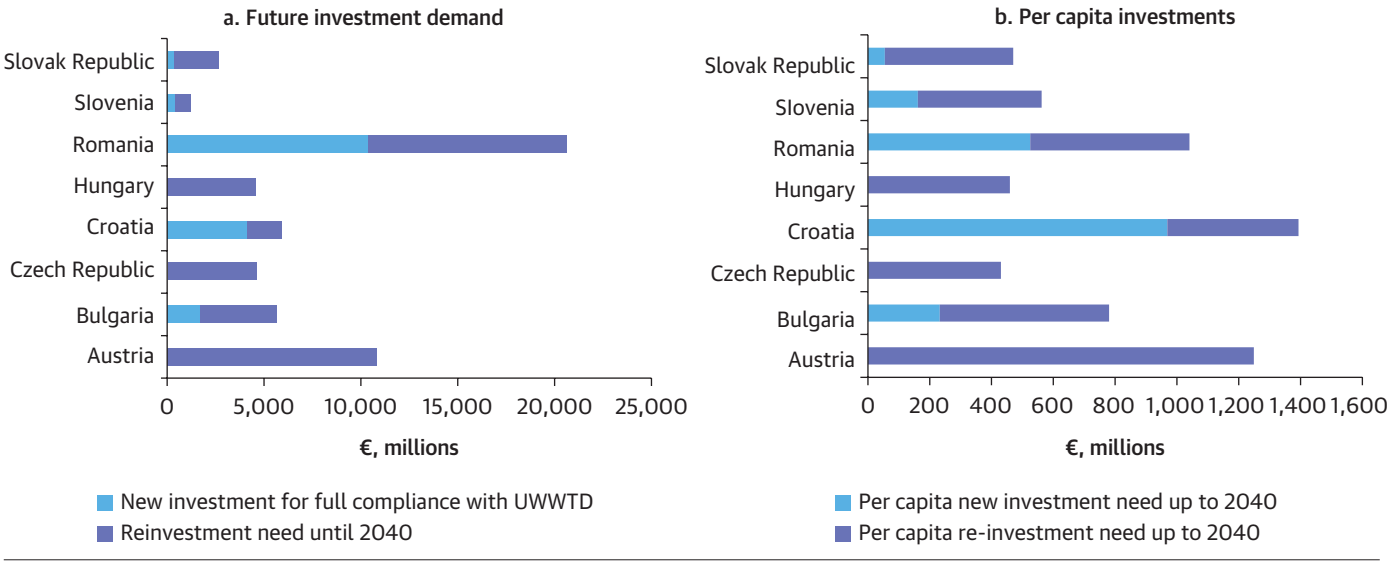
(€, millions)

Target countries	Reinvestment need on historical installations		Reinvestment need on future installations		Annual reinvestment need	Total reinvestment need until 2040
	Sewer network	WWTP	Sewer network	WWTP		
Austria	203	212	0	0	415	10,375
Bulgaria	67	41	16	43	167	4,175
Czech Republic	94	80	0	1	174	4,350
Croatia	0	0	61	19	81	2,025
Hungary	112	61	0	1	173	4,325
Romania	117	50	141	169	476	11,900
Slovenia	18	4	2	11	35	875
Slovak Republic	47	29	0	14	90	2,250
Danube region	658	476	221	258	1,613	40,275

Source: Umweltbundesamt et al. 2017.

Note: The reference year is 2015 and progresses for 25 years based on the calculated investment cost. For this assessment, the annual reinvestment requirements for a sewer network have been defined as 2 percent of the initial investment value (life expectancy of 50 years) and 5 percent for the WWTP (life expectancy of 20 years). UWWTD = Urban Wastewater Treatment Directive; WWTP = wastewater treatment plant.

FIGURE 3.8. Future Demand for Capital and Per Capita Investments to 2040 in Danube River Basin Member States, 2015



Source: Umweltbundesamt et al. 2017.

Note: UWWTD = Urban Wastewater Treatment Directive.

The situation might be more challenging in non-EU countries of the DRB, which face significantly larger investment needs and a lower level of economic development. The cost of UWWTD implementation for today's candidate and potential candidate countries (all countries of DRB with the exception of Ukraine) is estimated to amount to €19 billion, without asset renewal and small agglomerations (the case of Albania is presented in box 3.2). This represents about €35 per capita per year, and 0.34 percent of candidate and potential candidate countries' GDP (in PPP, current US$). While those are hypothetical at the moment, they may add up to the costs of UWWTD implementation in the DRB.

TABLE 3.4. Past UWWTD Compliance Investment among Danube River Basin Member States, before 2015

Countries	€, billions
Austria	14,338
Bulgaria	4,80
Croatia	0
Czech Republic	6,265
Hungary	6,813
Romania	6,842
Slovak Republic	2,938
Slovenia	970
Total	**42,346**

Source: Umweltbundesamt et al. 2017.
Note: UWWTD = Urban Wastewater Treatment Directive.

TABLE 3.5. EU Funds Used to Co-Finance Investments in Wastewater Infrastructure in Danube River Basin Member States, 2000-20

€, millions

Target countries	2000-06 ISPA, ERDF	2007-15 CF, ERDF	2014-20 Budgets CF, ERDF	Total EU contribution
Bulgaria	246	1,122	1,000	2,368
Czech Republic	397	229	0	626
Croatia[a]	21	200	1,100[a]	1,321
Hungary	493	410	900	1,803
Romania	1,044	2,382	3,810[a]	7,236
Slovak Republic	259	546	200	1,005
Slovenia	117	351	250	718
Total Danube region	**2,577**	**5,240**	**7,260**	**15,077**

Sources: World Bank staff calculations based on data from the European Commission's Director General for Regional and Urban Policy; ICPDR 2009; World Bank 2015; Umweltbundesamt et al. 2017.
Note: CF = Cohesion Fund; ERDF = European Regional Development Plan; EU = European Union; ISPA = Instrument for Structural Policy for Pre-Accession.
a. Partially disbursed after 2020.

More than one-third of wastewater infrastructure investment is financed through EU funds. However, because the situation is changing, significant increases of taxes and tariffs will be needed to fund future investments. An important proportion of the investment costs has so far been covered by transfers from EU cohesion funds for new EU member states, which account for more than 40 percent of investment funding in some countries. Up until 2020, €15 billion has been allocated and transferred. In the current programming period (2014-20) Romania, Croatia, and Bulgaria continue to receive substantial EU funding, as their wastewater infrastructure is still below UWWTD compliance requirements (table 3.5). But the reduction of EU allocations for the next EU budget period (2021-27) might jeopardize the overall funding of wastewater capex in the region just when investment will need to increase to ensure asset renewal. As a result, countries will have no option but to turn to a combination of taxes and tariff increases to fund those investments, presenting fiscal, political, and social challenges.

BOX 3.2. Investment Levels in the Water Supply and Sewerage Sector in Albania

The water supply and sewerage infrastructure in Albania is old, damaged, and inefficient. Demographic changes related to the rapid rural-to-urban population migration after the regime change in 1991, and the subsequent sharp increase in the demand for drinking water and sewage disposal services, have exacerbated the already precarious situation of the water supply and sewerage infrastructure, which is often operating at peak capacity. Although in recent years investments have been increasing, and recently more targeted toward wastewater, they were never sufficient to meet capital investment needs. According to the most recent information provided by the Ministry of Transport and Infrastructure, around €24 per inhabitant are invested yearly, financed from a combination of national and international sources. This amount remains well below the estimated €63 per capita per year needed to fund the investments (MPWT 2012) as stated in the National Water Supply and Sewerage Master Plan recently developed and approved by the Government of Albania as a fundamental tool for national investment planning.

The Master Plan is based on a sector analysis and considers national strategies and policies. It presents the total investments identified for both the water and wastewater sectors for 2012–40 (table B3.2.1). Through this tool, the elaboration of a priority ranking for the defined projects supports the sustainable use of investment funds in line with sector considerations and development policies. Based on priorities, a ranking according to short-, medium-, long-term investment is defined by considering national and foreign investments for water and sanitation. Eighty percent of the identified investment needs is planned to go toward wastewater management (sewer extension and wastewater treatment plant construction), which is consistent with the country's ambitions regarding EU integration.

TABLE B3.2.1. Wastewater Investment Needs in Albania, 2012–40

€, thousands

Sector	Item	Rehab.	Extension	New	Total	%
Water Supply	Utility based	530.5	352.7	3.4	886.6	17.45%
	OJ based	0	0	154.7	154.7	3.04%
	Total	**530.5**	**352.7**	**158.1**	**1,041.3**	**20.50%**
Sewerage	Utility based	285.2	1,899.8	522	2,707	53.28
	OJ based	1.3	16.2	1,325.7	1,343.20	26.22
	Total	**286.5**	**1,916**	**1,847.7**	**4,050.2**	**79.50%**
Total		**817**	**2,268.7**	**2,005.8**	**5,091.5**	**100%**

Source: MPWT 2012.

Note: Prior to the Territorial Administrative Reform (2015-16), the 58 water supply and sewerage utilities that officially provided data to the Benchmarking and Monitoring Unit in Albania covered 80 percent of the population. The remaining 20 percent, called Out of Jurisdiction (OJ), were served by communal/village systems.

3.3. Do Countries have the Technical and Institutional Capacity to Achieve and Maintain EU Compliant Wastewater Management?

Short answer: Technical and institutional capacity enhancement is crucial for successful wastewater management project implementation. One of the main bottlenecks for UWWTD implementation has been the lack of institutional capacity of the implementing utilities, given the size and complexity of investment projects. The tendering process has been challenging and has generated important delays. A lack of established mechanisms to fund equity contributions for the project beneficiaries is a serious barrier in some countries. Lack of political willingness; and slow responsiveness, knowledge, and information exchange and transfer between different levels of governance have had a negative impact on project identification, and have significantly slowed investment preparation and implementation. Local construction markets have not responded quickly enough to the significant increases of investment levels, leading to limited competition and higher costs. The challenges have shown that most new EU members have not manage to conduct the necessary institutional reforms or adjustments to prepare for a large investment cycle, resulting in low absorption of available funds and significant delays in UWWTD implementation.

Technical and institutional capacity enhancement is crucial for successful wastewater management project implementation. As mentioned in the previous section, achieving EU wastewater policies compliance requires the delivery of massive infrastructure investment programs, and the associated management, operations and maintenance (O&M) of assets. For various reasons, many countries in the region did not have the adequate capacity to set up these investment programs and ensure proper wastewater asset management. For instance, in some countries, provision of wastewater services was low during the pre-1990 era, and, hence, no capacity in this field existed. In other countries in which provision of wastewater services was high, the facilities and assets were managed according to standards that were not consistent with those of the EU. Moreover, as stated in previous sections, delays in EU wastewater policies' implementation and issues related to EU funds absorption are also showing limits in capacity to deliver the required massive investment programs.

Based on the findings from World Bank capacity building and investment support activities in the region, the following lessons have been drawn on the capacity to both deliver investment and maintain assets. These lessons could be valuable for the potential future member states from the Danube region that will almost certainly face similar issues.

One of the main bottlenecks for UWWTD implementation has been the lack of institutional capacity of the implementing utilities, given the size and complexity of investment projects. The water supply and sanitation (WSS) sector in the Danube region has not had to implement a national investment program of such magnitude ever before. While utilities often create special project implementation units (PIUs) to implement investments, these new units have to be trained and nurtured, and have faced multiple practical challenges during the projects' preparation and implementation. In addition, the pressure of investments to abide by compliance deadlines has not always allowed designers and local communities to

look for the best technical and financial solutions. Instead, they typically have sought for implementation easiness, which has proved appropriate in the short term but not optimal in the longer term. Project preparation and implementation mechanism established by the World Bank under Croatia Coastal Cities Pollution Control Project (2004-16) is a good example of a regional multi-entity project management scheme that has significantly benefited Croatia in developing critical infrastructure, therefore building its project preparation capacity during the preparation for the EU membership phase. In an effort to benefit from economies of scale and facilitate EU funds absorption, Romania, Hungary, and Croatia have turned to regionalization of WWS utilities. Although aggregation brings along its own issues (World Bank 2017), it has proven quite effective in improving capacity for project preparation and implementation by creating larger regional utilities, such as in Romania.

While trying to bridge investment gaps, all new EU member states have over-contracted their available EU budget, triggering absorption issues. New EU member states have rushed into investment programs that were not always optimized, as shown by the gap between the grants contracted and the payments effectively made on the basis of those grant contracts (table 3.6). Although the dataset displayed in the table does not reflect the EU grants strictly allocated and disbursed for UWWTD implementation, it gives an overview of issues experienced by the seven countries in using EU grant funding. The biggest variances between payment ratio and contracting ratio are observed for the Slovak Republic (25 percentage point difference) and Romania (43 percentage point difference) showing strong difficulties to absorb EU allocated funds. On the contrary, Slovenia displays only a 2 percentage point difference between payment ratio and contracting ratio. Hungary also achieved good results with a 6 percentage point deviation between payment ratio and contracting ratio, thus showing a good absorption capacity of EU grants. Croatia, which joined the EU in 2013, is an exception because it had a significantly shorter period to allocate, contract, and disburse funds.

TABLE 3.6. EU Fund Disbursement in Danube River Basin Member States, 2007–15

Target countries	Available budget (€, billions)	Available budget per capita (€)	Contracted grants (€, billions)	Paid grants (€, billions)	Contracting ratio (%)	Payment ratio (%)
Bulgaria	6.7	926.9	7.0	6.4	105	95
Czech Republic	26.3	2,495.9	27.0	23.3	103	89
Croatia	1.3	305.5	1.5	0.7	117	57
Hungary	24.9	2,528.6	29.2	27.7	117	111
Romania	19.1	959.5	22.1	13.9	116	73
Slovenia	4.1	1,987.8	4.4	4.3	107	105
Slovak Republic	11.7	2,144.4	14.2	11.3	122	97
Total	**94.1**	**1,621.2**	**105.4**	**87.6**	**112**	**90**

Source: KPMG 2016.

The tendering process has proved difficult and challenging, generating significant delays. Overcomplicated grant schemes and public procurement procedures requiring large volumes of documentation, combined with fundamental weaknesses in public procurement practices (lack of transparency and frequent irregularities in Bulgaria, the Slovak Republic, and Romania), have very significantly slowed down implementation. The average period between the signature of the financing contract and the signature of all works contracts for a water utility in Romania has been about three-and-a-half years. The average time for tendering a civil works contract has been about 10 months, but in some cases, it has exceeded two years even for small contracts. In addition, the lowest price has been the main criteria used to award contracts, which has created quality problems later during the implementation phase. A further challenge has been posed by the limited capacity of the local construction market. Local companies have not been able to respond quickly enough to the significant increases of investment levels, leading to limited competition and significantly higher costs than initially estimated. Anecdotal evidence shows that current project costs are up to 40 percent higher today in Croatia than they were shortly before accession, when sector wide investments in wastewater infrastructure were a few times lower.

A lack of established mechanisms to fund equity contributions for the project beneficiaries is a serious barrier in some countries (e.g., Romania) that should be addressed through the establishment of national financial support mechanisms (without actually using national funds) before countries launch into large investment programs. The Croatia Coastal Cities Pollution Control Project has been innovative, because it has introduced a concept of designated project-specific surcharge included in increased water tariff and collected at a designated account used specifically for project financing and loan repayment. Experience shows that this concept of direct beneficiary contribution not only works but also has a positive impact on project ownership and overall rationality.

Slow responsiveness, knowledge, and information exchange and transfer between different levels of governance and responsibility have had a negative impact on project identification, and have significantly slowed investment preparation and implementation. Experience from some countries (e.g., Croatia) confirms that implementation efficiency depends on the degree of integration of EU procedures into existing administrative and management mechanisms. In other countries (e.g., Bulgaria) the experience of suboptimal project preparation by municipalities that have received EU grants has led to "no-regret" financing approach and lack of optimized regional wastewater treatment solutions.

Countries should take advantage of the EU accession process to ascertain their institutional ability to deliver the investments and associated services. Countries must analyze the actual capacity of their local and national institutions to implement the necessary investment programs and subsequently manage the assets and deliver the services, before launching into the accession process. A positive example can be seen in the approach taken by the Croatian water authority (Croatian Waters) that has established a dedicated EU project unit for supporting the preparation and implementation of EU co-financed projects, in addition to a unit that works on approval and monitoring of water projects co-financed from EU funds (as Intermediate Body 2).

3.4. Is EU Compliant Wastewater Management Affordable for the Utility Companies and the People of the Region?

Short answer: Total cost recovery (TCR) is a challenge in most countries from the region. O&M costs are essentially financed through tariff revenues with either no or minimal subsidies provided by national or local governments. In general, with the exception of Austria, current tariffs in the studied countries are not sufficient to ensure TCR of actual wastewater services (including depreciation for future investment and reinvestment). Bringing wastewater management in compliance with EU wastewater policy brings a range of benefits, but also significantly increases O&M costs of utilities, triggering wastewater tariff increases that will continue in the future. These necessary tariff increases, needed to improve operational cost recovery ratio, will trigger affordability issues for the bottom 40 (B40) percent of population. The situation will be much more challenging for EU candidate countries, which will have to increase tariffs (or taxes) much more significantly to meet EU acquis despite lower levels of economic development.

Total cost recovery is a challenge in most countries from the region. Article 9 of the WFD requests member states to ensure adequate contribution of water uses to the cost recovery of water services. Furthermore, the "polluter pays" principle implies that polluters are responsible for the pollution they generate and, therefore, must bear the associated costs. For the 2014-20 EU program, the cost recovery principle was made mandatory through the necessity to fulfill an ex ante conditionality (European Commission 2014). This means that the approval of 2014-20 operational program was subject to the "existence of an adequate contribution of the different water uses to the recovery of the costs of water services," as stated in Article 9. The definition of what is an "adequate contribution" remains, however, at the member states' discretion.

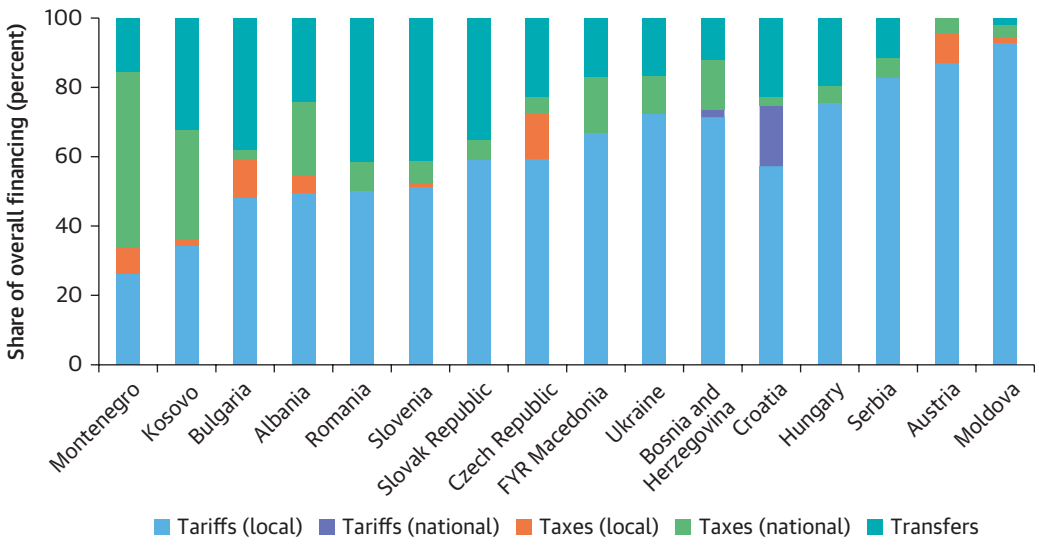
O&M costs in the Danube region are essentially financed through tariff revenues with either no or minimal subsidies provided by national or local governments (figure 3.9). In general, with the exception of Austria, current tariffs in the studied countries are not sufficient to ensure TCR of actual wastewater services (including depreciation for future investment and reinvestment).

The national average TCR from tariffs for wastewater for the eight countries studied in the region ranges from 0.24 to 0.86, well below the desired TCR value of 1 (Umweltbundesamt et al. 2017). The wastewater tariffs display substantial differences. Average wastewater tariffs in Austria (€2.0 per cubic meter) are more than three times higher than in Bulgaria (€0.6 per cubic meter) (figure 3.10).

The average O&M costs per cubic meter for wastewater services of the EU member states of the region amounts to 1.1/m^3. It fluctuates in a ratio of 1 to 5 with a maximum of €1.5/m^3 (for Austria) and a minimum of €0.3/m^3 (for Bulgaria) (figure 3.11).

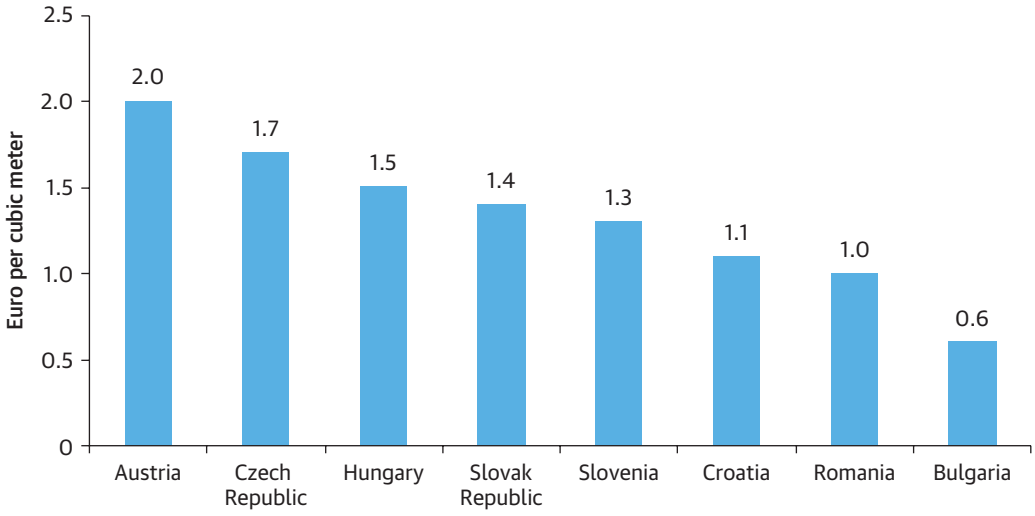
Wastewater management alignment with EU wastewater policy compliance significantly increases O&M costs of utilities, triggering wastewater tariff increases that will continue. Necessary investments for the improvement of wastewater collection and treatment have

FIGURE 3.9. Financing Sources for Water Supply and Sanitation in Danube River Basin Countries



Source: World Bank 2015

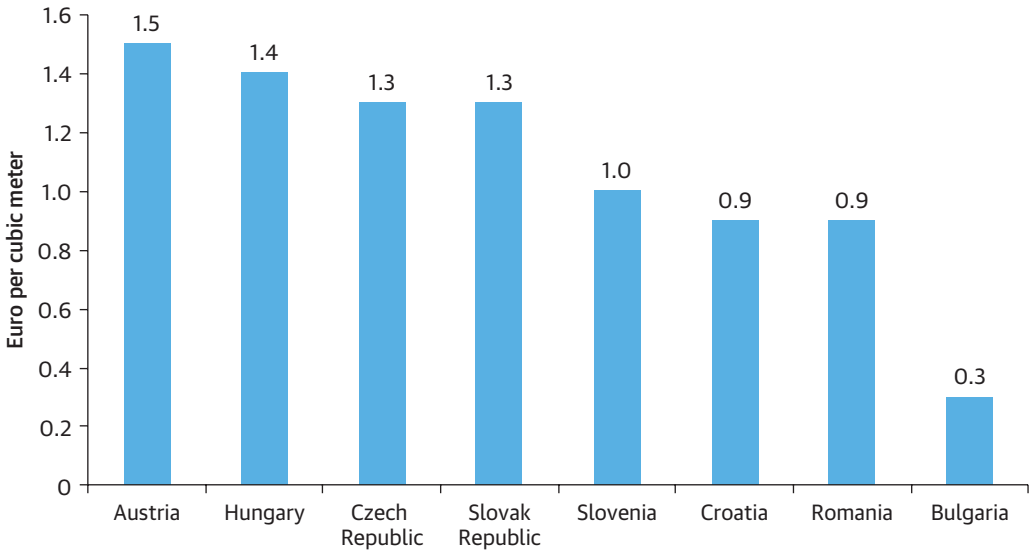
FIGURE 3.10. Tariffs of Wastewater Collection and Treatment in Danube River Basin Member States



Sources: Umweltbundesamt et al. 2017; World Bank 2015.

been matched by significant increases in overall operating expenses, leading to parallel tariff increases (World Bank 2015). As a result, a significant shift in the water and wastewater tariff structure has happened. Whereas wastewater represented about 50 percent of the total average water and wastewater invoice in the 1990s, this share presently represents 60 percent, and is anticipated to reach 70 percent after UWWTD full implementation due to expensive tertiary treatment (Umweltbundesamt et al. 2017).

FIGURE 3.11. O&M Costs of Wastewater Collection and Treatment in Danube River Basin Member States



Sources: Umweltbundesamt et al. 2017; World Bank, 2015.
Note: O&M = operations and maintenance.

The supporting study conducted national analyses of long-term financial sustainability of tariffs until 2040 and used two key indicators: the operation cost recovery (OCR) ratio (includes only O&M costs), and the total cost recovery (TCR) (includes O&M costs but also investment and reinvestment including financial costs). The analysis was conducted for two scenarios that integrate investment and reinvestment, including the cost of financing, O&M costs, and tariff revenues of the utilities. Costs and revenues are expressed in real terms (with no inflation impact taken into consideration) on the basis of 2015. A first "business as usual" scenario considers only two off-sector elements as factors of change, such as population change and labor cost increases affecting O&M costs. A second scenario, called a "sustainability orientated pathway (SOP)," attempts to simulate the outcome of financial operation when tariff increases compatible with EU affordability rules are applied. In this scenario the aim of the revenue increase is to achieve OCR ratios comparable to the current Austrian level (1.44-1.6) and TCR ratios not lower than 1. TCR was defined as embracing not only O&M costs but also investment and reinvestment including financial costs to be achieved as soon as possible within the affordability threshold encouraged by EU guidelines.

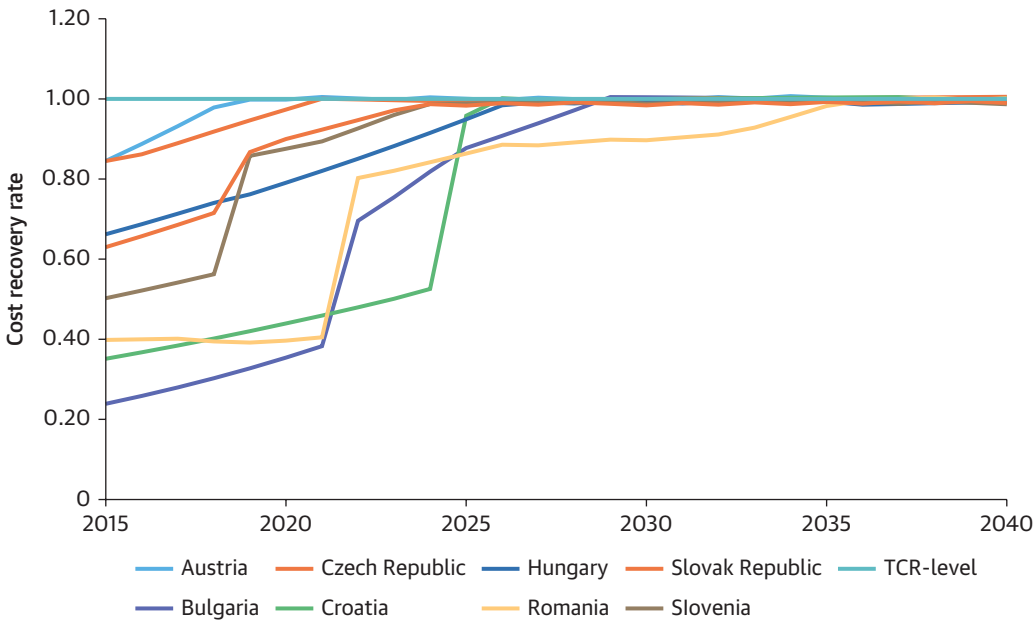
Without a tariff increase, the OCR ratio for the wastewater sector is expected to decrease in all analyzed countries below O&M cost covering requirements, except in Austria. Because countries will not be able to cover their O&M costs, wastewater service provision can be expected to deteriorate and eventually become unsustainable. By 2040, the typical TCR would range between critical and poor (0.5-0.7 for six countries and for Bulgaria even lower, 0.3), while only Austria is expected to have a better ratio of 0.9.

In the sustainability orientated pathway scenario that considers robust annual tariff increases within the boundary of EU recommended affordability threshold,[2] and with productivity and efficiency gains by operators, countries can expect their TCR ratio through tariffs to reach 1 within a variable timeframe: Austria within five years and Romania after 25 years, and with annual tariff increases from 1 percent to 5 percent over the entire period (figure 3.12).

The necessary tariff increases to achieve full cost recovery will trigger affordability issues for the B40 of population in some countries. The SOP for 2015-40 is using 3 percent as the affordability threshold for wastewater tariffs for the poorest segment of the population. The analysis of affordability[3] of wastewater prices for the poorest 40 percent of the population clearly reveals alarming affordability problems over the years, especially in Hungary, Bulgaria, and Romania (table 3.7). For the B40, paying the prices corresponding to the full implementation costs of UWWTD is expected to be affordable in Austria, Slovenia, Czech Republic, and the Slovak Republic. In Croatia affordability issues should be transitory and disappear by 2035. Following the analysis, these caveats should be highlighted:

- Should one or more of the assumptions of the modeled scenario (GDP growth, social tolerance, efficiency gains) not be met, financing gaps, especially for capital investment and reinvestment, would appear, which could still be bridged by EU grants for a limited period, until perhaps 2021-27.

FIGURE 3.12. Estimated Long-Term Evolution of TCR Ratios in Danube River Basin Member States, SOP Scenario, 2015–40



Sources: Umweltbundesamt et al. 2017; World Bank, 2015.
Note: Cost recovery rate here refers to total revenue per total expenditure (operational plus capital expenditures).
DRB = Danube River Basin; SOP = sustainability orientated pathway; TCR = total cost recovery.

BOX 3.3. Sustainability of O&M Costs of WWTPs in Bosnia and Herzegovina

Access to public services in Bosnia and Herzegovina is around 60 percent for water supply and 32 percent for wastewater collection. During recent years, with significant financial support from the EU, several WWTPs (in Sarajevo, Bihać, Mostar, Bileća, Konjic, and Zivinice) have been constructed or reconstructed, increasing percentage of wastewater treatment from 3 percent to currently 20 percent. However, authorities face challenges in the postcompletion phase of the project to maintain the achievements, for example: (i) low financial capacity because of low tariffs and substantial overall inefficiencies in the public water utility (PWU) operations; and (ii) low technical capacity, lack of qualified staff, and lack of interest from the authorities in improvement of the PWUs' accountability through reforms.

O&M of newly constructed WWTPs is under the responsibility of municipal PWUs, which have neither the adequate financial nor human resources to manage it. Although operation of the facilities has started, the tariff structure for services has not changed, directly endangering both wastewater treatment and water supply systems. Often, support to PWU to manage WWTPs is given on an ad hoc basis, mainly through financial subsidies from municipal or higher levels of government (Sarajevo WWTP). This situation is directly endangering investments, and PWUs are struggling to secure stable funding for WWTP operation. If practices do not change soon, some may stop working. Typical is the city of Mostar, in which the World Bank, an EU delegation, and the Swedish government have invested more than US$13 million in construction of the WWTP. Although all works were finished in June 2017, the facility is still not in operation (as of May 2018) due to lack of local financial and operational capacities to run the WWTP. This clearly shows that local communities and higher governmental intervention have failed to perform necessary assessment of affordability and operating costs of the WWTP and other capital investments before its implementation.

Although Bosnia and Herzegovina is not an EU member state, its legal framework is being harmonized with the EU acquis (Drinking Water Directive and UWWTD). However, the implementation is very weak, and the new legal and operational framework should be established to enable sustainable development and operation of WWTP investment.

Findings of the World Bank Implementation Completion and Results (ICR) report, prepared for recently completed projects (Sarajevo Wastewater Project and Water Quality Protection Project), have identified issues characteristic for water utility operations and projects in Bosnia and Herzegovina and regionwide, including the following:

- The financial sustainability of the water utilities is often precarious and efforts are needed to ensure that utility can fully cover their operating costs.

box continues next page

BOX 3.3. continued

- Project objectives should be closely tailored to the capacity of the government and utility and the conditions of the enabling environment existing at the time of project preparation.
- Operation costs need to be properly calculated.
- Affordability of tariffs needs to be carefully assessed before the project.
- Authorities at various levels in government must secure upfront sustainability of investments and commitment to guarantee sustainable and efficient operations.
- Active measures for wastewater collection and users' connection to sewers must exist as construction of wastewater treatment facilities are constructed.
- Implementing sectoral or tariff reforms needs to be joined with improvement of water and wastewater services for consumers to find tariff increases acceptable.

TABLE 3.7. Estimated Changes in Affordability Ratio of Wastewater Tariffs for the B40 in Danube River Basin Member States, SOP scenario, 2015–40

Countries	2015	2025	2035	2040
Austria	1.06	1.10	0.98	0.93
Bulgaria	3.31	4.37	4.76	4.71
Czech Republic	2.00	2.24	2.17	2.15
Croatia	2.59	3.14	2.55	2.24
Hungary	3.20	3.90	3.27	3.00
Romania	5.15	4.41	4.41	3.86
Slovenia	0.79	0.95	0.86	0.79
Slovak Republic	2.57	2.97	2.57	2.37

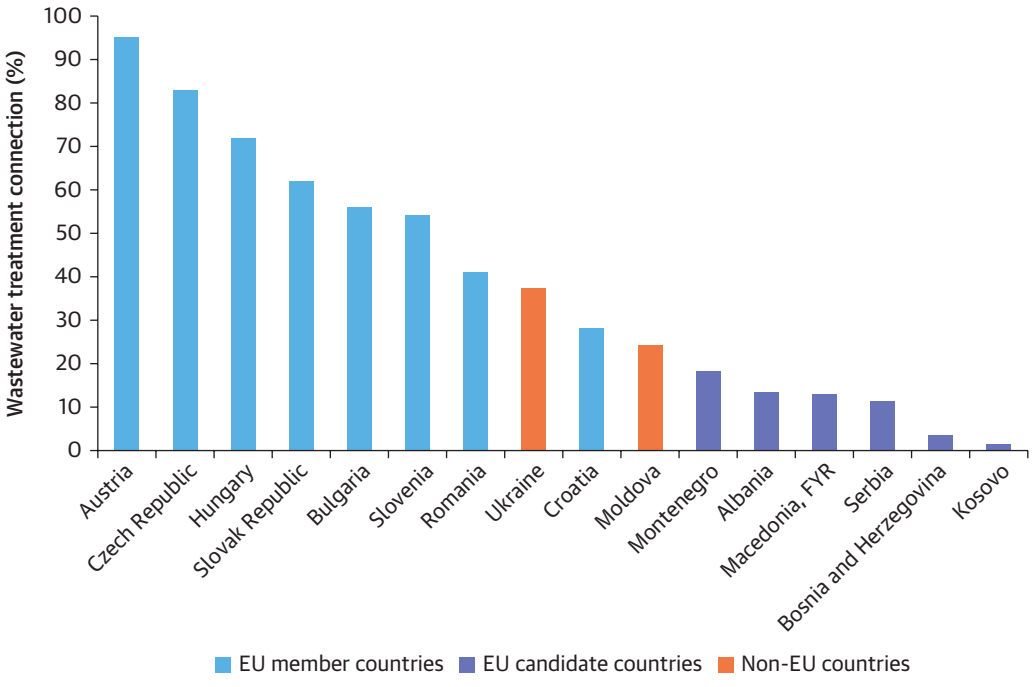
Sources: Umweltbundesamt et al. 2017; World Bank 2015.
Note: B40 = bottom 40 percent; SOP = sustainability orientated pathway.

- Tariff increases required for the SOP scenario will not be easy to implement for political reasons because the population may not be willing to accept continuous price increases. Consequently, UWWTD asset depreciation costs may not be fully covered. In the absence of sufficient national and European grants, the asset management situation might become critical. Market-based loans or bonds could be an option to temporarily bridge financing gaps but will, however, have to be reimbursed using tariff revenues.
- Because commercial loans or bonds are provided only to creditworthy organizations, water and wastewater utilities—and related municipalities—must start early to build up their credit ratings and creditworthiness to gain access to money markets for their UWWTD-related capital investments and reinvestments.

Finally, while the affordability analysis focused on the B40, for the poor and extreme poor, those constraints will appear much earlier, and the governments should address them through timely developing properly designed, targeted subsidy schemes. Here again, **constraints will be much more significant for EU candidate countries**. Many of the candidate countries currently have low and relatively affordable WSS services, given the limited levels of wastewater treatment provided (figure 3.13 and figure 3.14, panels a and b).

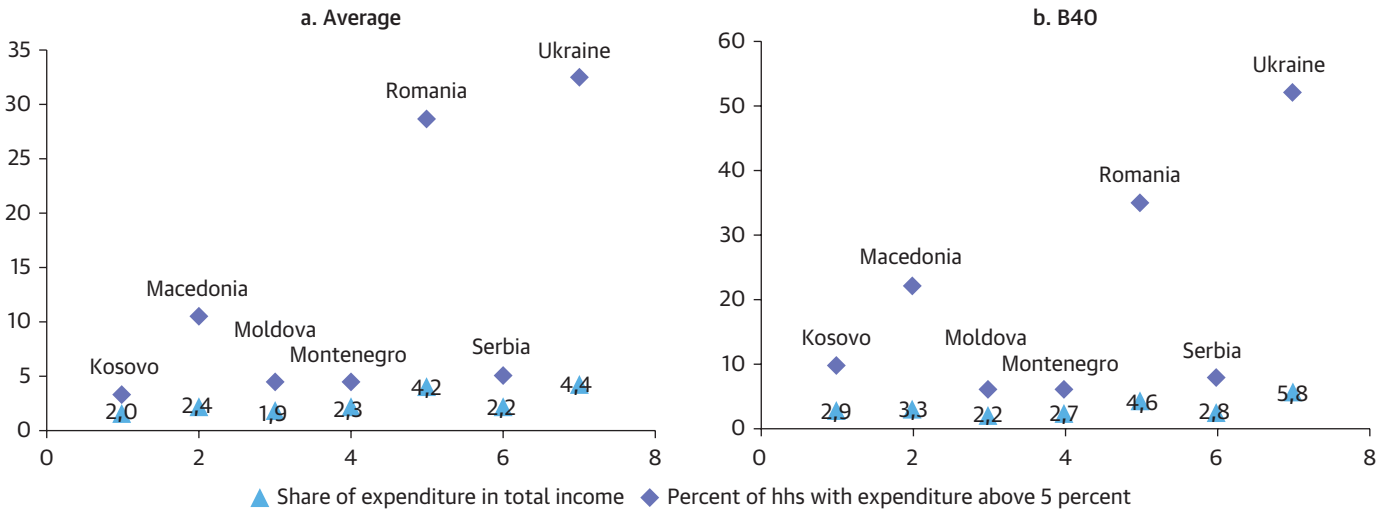
Potential candidate and candidate countries such as Albania, Bosnia and Herzegovina, and Kosovo have much lower levels of access and service levels in terms of sanitation, specifically in rural areas. While willingness to pay for reliable and good quality drinking water among nonconnected households is substantial, wastewater services improvements will require a steep increase in tariffs that will require even more targeted support mechanisms, and intensive communications to timely increase the willingness to pay (World Bank 2018). Higher investment needs, potentially lower EU contributions, and lower levels of economic development in most of the candidate or potential candidate countries mean that tariffs will have to rise significantly, and affordability issues will be much more pronounced than in EU member countries.

FIGURE 3.13. Wastewater Treatment Coverage in Danube Region, 2012



Source: World Bank, IAWD, and GIZ 2015.

FIGURE 3.14. Affordability of Water and Wastewater Tariffs for Income Groups in Selected Countries of Danube Region



Source: World Bank, 2015.
Note: B40 = bottom 40 percent; hhs = head of household.

3.5. Is EU Compliant Wastewater Management Implemented in an Economically Efficient Manner?

Short answer: The challenges highlighted previously raise the question of economic efficiency of the implementation of the UWWTD in the Danube region. While further work is needed to reach a more robust conclusion, assessment conducted under this study, on the basis of limited literature review and available evidence, shows no compelling self-standing economic case to support full compliance with the Directive in the Danube region. This makes it all the more important to ensure that the Directive is implemented in the most economically efficient manner, to maximize economic cost-benefit ratio of the Directive implementation.

The challenges highlighted previously raise the question of whether the full implementation of the UWWTD is economically efficient in the Danube region. The UWWTD is an important environmental legislation that levels the field for environmental and public health protection—and overall access the European single market—and, therefore, does not necessarily need to yield a positive economic cost-benefit ratio by itself. Nonetheless, an attempt was made to quantify costs and benefits of the Directive's implementation in the Danube region to further inform the discussion on ensuring its success. The analysis was limited by available information and resources, and mainly relies on available literature review and expert estimates. As such, it should therefore be seen only as a way to spur the dialogue, highlighting a need for a deeper and more detailed analysis. The economic assessment of UWWTD implementation here considers the economic costs of the Directive implementation and the economic benefits deriving from good water quality, including health and environmental impacts. In a supporting report (Umweltbundesamt et al. 2017), the unit benefit

transfer methodology, combined with estimates of the willingness to pay for good water quality extracted from past studies, are used to derive countrywide estimates of the economic value of UWWTD compliance in the Danube region. The estimated values are not very robust, but they provide an indicative range of what the economic benefits of UWWTD compliance are for the DRB member states. Though they may represent the most significant source of economic value to justify UWWTD implementation, the costs and benefits of ecosystem services are not being adequately addressed in the Danube region due to the absence of a feasible method for estimating and monetizing the environmental benefits of improving the Black Sea's water quality.

Results of the cost-benefit assessment of the UWWTD do not allow confirmation that full implementation of the Directive is economically efficient for the Danube region. The following costs are taken into account: investment, reinvestment, and O&M costs for wastewater collection and treatment system required under UWWTD Articles 3, 4, and 5. Administrative costs—along with environmental and resources costs—have been ignored in this first approximation due to a lack of data. On the benefit side, health, environmental, and social benefits have been taken into account based on the willingness to pay for good drinking water quality (health benefits) and for good water resource quality for environmental and social purposes (environmental and social benefits) (Umweltbundesamt et al. 2017). According to the literature reviewed, the environmental benefits for good water quality are 10 to 30 times higher than health benefits, as is generally the case in upper income countries.

For all the countries analyzed for the period 2000-40, the cost of implementing the UWWTD stands above the higher range of the estimated benefits (figure 3.15). Hence, regardless of how economic benefits are valued (lower or higher estimates), the implementation of the UWWTD shows no apparent economic surplus, even when considering the higher range of estimated economic benefits (figure 3.15, table 3.8, and table 3.9).

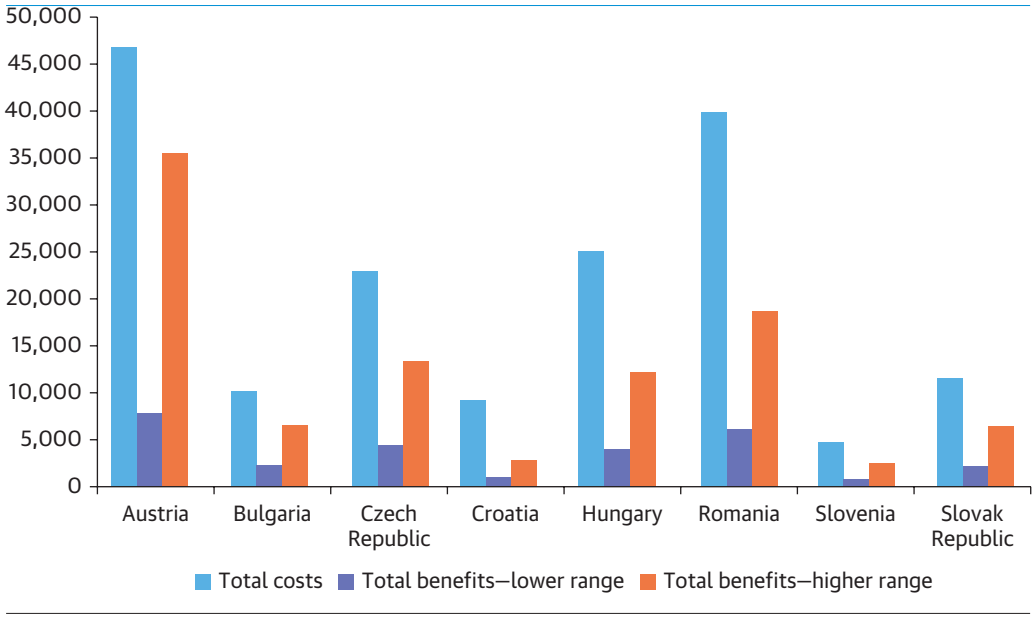
When considering the period 2000-40, the expected net present value (ENPV)[4] remains slightly negative and the economic internal rate of return (EIRR) is only marginally positive (2 percent to 3 percent) for most countries. These estimates are rough, however, and need further in-depth analysis.

The ENPV corresponds to the discounted aggregated value of the economic costs and benefits of the investment made over the assessment period. The EIRR is the discount rate that yields an ENPV of zero. If positive, it is an indicator that the investment has generated an economic surplus for the beneficiary populations of the Danube region. The cost-benefit ratio of UWWTD investment costs compares discounted costs and benefits over the assessment period. If above one, the investments generate an economic surplus to the concerned societies.

A more positive cost-benefit ratio for UWWTD implementation may appear when more benefits are qualified, quantified, and monetized and when policy makers can assess and account for the full economic value of water-related ecosystem services. Regardless, EU member states should explore possibilities to increase benefits from UWWTD implementation, including promotion of water-related recreation activities, and wastewater reuse for irrigation in

FIGURE 3.15. UWWTD Related Costs and Benefits Discounted (2015) in Danube River Basin Member States, 2000–40

€, millions



Source: Umweltbundesamt et al. 2017.

Note: UWWTD = Urban Wastewater Treatment Directive.

TABLE 3.8. UWWTD Related Discounted Costs and Benefits (2015) per Danube River Basin Member States, 2000–40

€, millions

Elements	Present value of costs and benefits							
	Austria	Bulgaria	Czech Republic	Croatia	Hungary	Romania	Slovenia	Slovak Republic
New investment	14,388	5,560	6,266	3,145	6,824	15,447	1,266	3,202
Reinvestment	12,603	2,492	3,367	1,602	3,453	5,717	552	1,668
O&M	19,455	1,979	13,241	4,370	14,623	18,501	2,921	6,512
Funding	371	72	117	37	94	204	19	49
Subtotal	46,817	10,103	23,171	9,154	24,994	39,869	4,758	11,431
Health benefits (lower range)	309	21	102	27	94	121	19	44
Health benefits (higher range)	1,823	128	609	165	563	727	117	263
ERC benefits (lower range)	7,475	2,166	4,237	894	3,877	5,956	778	2,049
ERC benefits (higher range)	33,637	6,498	12,710	2,683	11,630	17,869	2,335	6,146
Sub-total benefits (lower range)	7,784	2,187	4,339	921	3,971	6,077	797	2,093
Subtotal benefits (higher range)	35,460	6,626	13,319	2,848	12,193	18,596	2,452	6,409

Source: Umweltbundesamt et al. 2017.

Note: ERC = environmental and resource costs; O&M = operations and maintenance; UWWTD = Urban Wastewater Treatment Directive.

TABLE 3.9. Economic Indicators among Danube River Basin Member States toward Implementation of UWWTD, 2000–40

Indicators	Austria	Bulgaria	Czech Republic	Croatia	Hungary	Romania	Slovenia	Slovak Republic
ENPV (lower range) (€, millions)	–39,033	–7,915	–18,653	–8,232	–21,024	–33,793	–3,961	–9,339
ENPV (higher range) (€, millions)	–11,357	–3,476	–9,672	–6,306	–12,801	–21,274	–2,307	–5,023
EIRR (higher range) (%)	3	10	6	..	2	3	3	5
Cost/Benefit ratio (higher range)	0.76	0.66	0.58	0.31	0.49	0.47	0.52	0.56

Source: Umweltbundesamt et al. 2017.
Note: DRB = Danube River Basin; EIRR = economic internal rate of return; ENPV = economic net present value; UWWTD = Urban Wastewater Treatment Directive.

specific areas sensitive to climate change. To build a more robust economic assessment of the benefits of UWWTD implementation, more relevant datasets need to be developed and monitored at country and river basin levels.

While further work is needed to reach a final conclusion, the UWWTD is and will remain one of the key environmental legislations, and future focus should be put on implementing it in the most cost-effective and economically efficient manner. The prevailing driver for UWWTD compliance remains the need for uniformity of regulatory compliance under the EU directives, and environmental protection beyond strict economic justification. This, however, does not mean that economic efficiency could not be improved by a closer alignment with the WFD principles and objectives, for example, through better prioritization of wastewater infrastructure investment (focusing on wastewater systems having a large negative impact on environment, and upgrading levels of treatment primarily based on environmental monitoring of water bodies' status), and adoption of more phased development (avoiding financing expensive, oversized infrastructure designed for long-term needs). In addition, the use of economic appraisals, such as cost-effectiveness analysis or cost-benefit analysis, to assess the impact of wastewater projects could help improve investment efficiency while maintaining environmental and health benefits and achievement of WFD objectives.

Notes

1. Information regarding emissions from UWWTD agglomerations is available from the ICPDR Urban Waste Water Inventory for the reference years 2005-06 and 2011-12 and was additionally calculated for all years between 2005 and 2014 by means of information provided by the member states for the TA-UWWTD.
2. The EU recommended affordability threshold corresponds to 4 percent of household disposable income of the lowest income group for water and wastewater expenditure.
3. Affordability is calculated as the share of wastewater expenditure in household disposable income.
4. The discount rates used in the analysis derive from the Annex III to the European Commission (EC) guidelines regarding the implementation regulations on the application form and cost-benefit analysis methodology for the programming period 2014-20. The discount rate for older EU member states is set at 3 percent while it reaches 5 percent for new EU member states.

Chapter 4 Recommendations

Building upon the outcomes of the analysis performed, some recommendations have been formulated to respond to the challenges identified in the previous sections. These are divided between recommendations to member states implementing the current Directive; recommendations to candidate or potential candidates preparing for European Union (EU) membership; and recommendations to the European Commission (EC) as it considers whether to review Urban Wastewater Treatment Directive (UWWTD) requirements.

4.1. Implementation of the Directive

Several of the new member states in the region are struggling to comply with the UWWTD. In fact, an infringement procedure has been opened against Bulgaria in July 2017 when the Commission sent a letter of formal notice. Romania is currently significantly lagging behind the schedule, with full compliance forecasted to be reached by 2027-30, far beyond the final deadlines of 2015 and 2018. As countries move forward and address those shortcomings while maintaining the cost of services at affordable levels, the following recommendations might be useful.

Use a regional approach to optimize wastewater management. To achieve a better efficiency and to minimize costs of service provision, wastewater infrastructure would be best planned and potentially implemented and managed at regional level, following the philosophy of the Water Framework Directive's (WFD's) River Basin Management Plans. Using a regional approach to optimize the Directive's implementation could be explored rather than having each utility or municipality set up its own investment program. Such an approach would generate many positive externalities. It would allow policy makers to, for instance, prioritize wastewater management investments at a regional level, generate infrastructure economies of scale, and explore potential for reuse and circular economy at a regional level.

Foster the adoption of cost-effective innovations in the wastewater sector. More efforts are needed to foster the adoption of new technological innovations in the wastewater sector. Recently, new technologies spreading from the digital revolution have allowed for more efficient wastewater management (e.g., remote monitoring of water quality and wastewater reuse) and optimized investment costs (e.g., for wastewater: individual and other appropriate systems and extensive treatment with reeds beds). Nature-based treatment solutions could also be favored to lower capital expenses (capex) and operating expenses (opex). Implementation should follow circular economy focus of EU institutions: using the wastewater treatment plant (WWTP) as a resource unit, and making it more energy efficient through various options (e.g., biogas, incineration). Promoting innovations should be part of the government's reform agenda. Moreover, the legal constraints put in place against public-private partnerships in water supply and sanitation (WSS) services in some countries is reducing opportunities to benefit from private sector innovations, such as with

build-operate-transfer (BOT) schemes promoting technical innovations in WWTPs through a results-based turnkey approach.

Revisit the institutional setup for wastewater management, where relevant, to address limited national and local capacity. Strong implementation capacity is crucial for optimal development of wastewater infrastructure and better absorption of EU funds. Good practices indicate that the establishment of a proper institutional framework and the timely implementation of water utility sectoral transformation and reform process significantly increase chances for success. Various arrangements can be explored to address limited local capacity in wastewater management. For instance, in Austria, multiple small municipalities group into Zweckverband, which is a special-purpose vehicle set up to develop WWTP investment projects. In Portugal, regional wastewater treatment utilities have been set up to address technical capacity issues and generate economic efficiency. Support for further capacity building policies in wastewater management is needed to ensure and strengthen the existence of a professional workforce in the WSS sector. Strengthening utilities in their efforts to provide efficient and sustainable services is a key focus of the Danube Water Program (DWP), which supports capacity development in complex managerial topics. Moreover, investing in training can create appropriate capacity in the utilities and universities for the next generation of water challenges.

Address the question of opex financing and affordability upfront. Positive impact created by massive investments in wastewater infrastructure can be preserved and further enhanced only if service quality levels are sustained. This requires the O&M and renewal costs to be covered by the revenues of the service providers in the long term. This leads to necessary tariff increases, which trigger affordability issues to be addressed through targeted subsidies for the poorest part of the population. If system operation and reinvestment are not financially sustainable, there is a high risk of decline in service quality and deterioration of the quality of discharges into receiving waters. Hence, opex sustainable financing should be addressed upfront in the UWWTD implementation process. WWTP projects should come with a clear costing, including life cycle and long-term costs and a funding plan. They should be supported with the necessary political commitment.

Prioritize investments according to their impact rather than on a readiness basis. Better prioritization of investments is needed to maximize the impact of available resources on UWWTD compliance and WFD objective fulfillment. Despite the approximately €42.5 billion invested in the sector since 2000, the improvement of sewerage and treatment coverage has not progress as expected. One cause is bad prioritization of investment because resources have not been directed to the most impactful infrastructure. Because most countries will not achieve timely compliance, they should focus efforts on the most impactful projects initially, and gradually move toward projects with lower environmental impact using cost-benefit analysis. Hence, investments should be prioritized on only on the basis of agglomeration size as per UWWTD requirement but also with the goal of reaching WFD environmental objectives in the most cost-effective way. Moreover, EU funds could be

prioritized toward investments in which the disconnection between externalities and direct benefits is the largest, or in which affordability issues will be most severe. In addition, a solid regime of time-sensitive fines should be approved to incentivize local governments to implement wastewater management master plans rather than wait for a grant opportunity.

Strengthen utilities' financial viability to ensure sustainability and access to financial markets. Financing gaps between tariff revenues and total costs of wastewater services exist in several new member states of the region, which can be expected to widen further with increasing advancement toward full UWWTD compliance. This can be a very serious problem in the medium to long term. Should EU grants for UWWTD investment cease around 2027, the financing gap for remaining investment and reinvestment will be bridgeable only with commercial loans. This will require governments to facilitate the establishment of financially viable water utilities. Reforms need to be launched as soon as possible in each new member state to enable water utilities and municipalities to become creditworthy. The financial position of operators and owners ought to be characterized by transparency, accountability, and autonomy. It is only after these qualities become prevalent that the national or international financial market could expect to be invest in wastewater utilities.

4.2. Candidate Countries

Most of the current and potential candidate countries are far from complying with the UWWTD. They also face significantly lower economic development levels than EU member states, which further constrains their ability to mobilize either taxes or tariffs to fund the needed investments. This represents a challenge, but also an opportunity to learn from the lessons of the most recent member states in preparing themselves. Below are a few recommendations.

Invest into a better process to plan wastewater management compliance and avoid underestimating the time needed for directive compliance. Building upon the experience of the new EU member states of the Danube region, candidate countries should prepare a strategic plan for wastewater infrastructure compliance well in advance of accession negotiations. To do so, they should invest into the development of regional master plans and roll them out ahead of time. Moreover, during the accession process, candidate countries need to negotiate appropriate deadlines to implement UWWTD, accounting for the economic affordability of this costly piece of EU environmental legislation.

Assess institutional and technical capacity to deliver and maintain wastewater infrastructure. Ahead of accession negotiations, candidate countries should thoroughly understand and determine what investments are required to reach UWWTD compliance. They should also realistically assess the time required to avoid delays and possible infringement procedures. This review should include an analysis of the institutional and technical capacity needed to timely deliver and maintain wastewater infrastructure. Necessary reforms should then be proposed to develop and strengthen institutional and technical capacity and address shortcomings.

Develop a financing strategy for affordable, sustainable wastewater management. Implementing the UWWTD implies substantial investment that needs to be planned well in advance and staged to facilitate and secure the mobilization of the required financial resources at the lowest costs. WWTPs with secondary and tertiary treatment tend to have significant O&M costs that need to be covered by wastewater system users through tariffs. As a result, developing a financing strategy using the "3Ts" (tariffs, taxes and transfers), for the wastewater sector can soundly determine the financial feasibility of investments and sequence implementation toward achieving UWWTD objectives. Moreover, the financing strategy should address existing and future affordability constraints with targeted subsidies for the poorest individuals and households, who will not be able to cope with projected tariff increases.

Conduct the reforms and policy changes necessary to implement the recommendations ahead of time. Considering the preceding recommendations, candidate countries should develop and implement the critical package of reforms needed to address the challenges and issues on technical and financial levels.

4.3. Potential Review of Directive

The Commission is currently considering whether the Directive should be reviewed. While many considerations will go into any revision of the current requirements, the following are recommendations that could significantly ease the implementation of the Directive in the Danube region without compromising the overall environmental objectives provided by the WFD.

Align the UWWTD more closely with WFD objectives. The UWWTD is a relatively simple directive, requiring only limited data and model and planning capacity for its implementation (in contrast, for example, to the WFD). Due to its simplicity member states know exactly what is expected, and the progress can be easily tracked and good level of enforcement ensured, which make it an important asset in EU environmental policy. This simplicity, however, does not provide much space for policy makers and planners to adjust requirements to situations that might differ from those for which the directive was initially designed. In most of the older EU member states, basic measures deriving from the UWWTD were not sufficient to reach a good status of water bodies, making a discussion of the relevance of the UWWTD measures—which are part of the WFD basic Programmes of Measures—somewhat unnecessary. This is, however, not the case in much of the Danube region. UWWTD review discussions could restate that achieving WFD environmental objectives in the most cost-effective way remains the key priority of EU water and wastewater policy. Giving more flexibility to member states to optimize their urban wastewater policies could offer ways to improve the economic efficiency of the UWWTD implementation while focusing on WFD environmental objectives' fulfillment. For instance, if the economic costs of a project are higher than its economic benefits, lower levels of wastewater treatment could be allowed as long as the proposed investment option is cost-effective, WFD goals are achieved, and public

health is safeguarded. Still, the UWWTD is not the only EU directive dealing with water quality, and its contribution to reach WFD good status is partial.

Strengthen the economic basis for UWWTD impact and assessment. The lack of comprehensive and transparent central database with wastewater discharges—emissions, investments, and water quality information—in the Danube River Basin (DRB) at national and local levels has made assessing the impact of UWWTD implementation on health, social, and environmental improvements difficult. No systematic effort to link waterborne diseases information to wastewater management and surface water quality could be identified for the Danube region. Data models to assess the different pollutant pathways into the aquatic environment (which exist for biggest polluters through the European Pollutant Release and Transfer Register [E-PRTR] and the UWWTD) should be expanded and integrated to apply in all the countries' river basins to better quantify individual pressures (e.g., diffuse sources, such as agriculture, versus point sources such as WWTPs) and benefits associated with UWWTD implementation. Focusing on implementing an integrated, detailed information system would allow better assessment and prioritization, for a small fraction of investment costs, making it high value for its cost. Because achieving WFD environmental objectives is a key priority, UWWTD review discussion could consider exceptions to the Directive requirements when no clear environmental and health benefit derives from the UWWTD implementation. In the meantime, policy makers should evaluate and document the economic values of implementing the UWWTD. Member states should explore possibilities to increase benefits from UWWTD implementation (e.g., promoting activities that benefit from good water status such as tourism, water sports, fishing, and irrigation).

Introduce a solid economic and environmental analysis of individual projects to allow lower level of treatment when it is cost beneficial. Revision of the UWWTD could introduce a solid economic appraisal and environmental impact assessment to assess individual investment projects. If a project is not assessed as cost beneficial, alternative wastewater treatment could be allowed as long as overall environmental impact is acceptable and WFD goals are achieved. For example, longer marine and submarine outfalls could eliminate the need for more advanced level of wastewater treatments, and allow the achievement of good water status with substantial opex and capex savings. The use of economic appraisal could help reduce capex and opex, and improve investment economic efficiency while maintaining environmental and health benefits and WFD objectives' achievement.

Provide more flexibility on the choice of technology especially in rural areas and small towns. UWWTD implementation, through constructing dedicated wastewater collection and treatment systems with secondary and more stringent treatment, has improved water quality of DRB surface waters primarily by reducing organic load and, to a lesser extent, nutrient load discharge. In rural areas or small settlements, just above 2,000 population equivalent (PE), some flexibility should be given to local utilities to adopt measures such as green infrastructure or nature-based solutions that could be well adapted to their issues, less costly, sufficient to achieve WFD objectives, and financially sustainable. The concept

and definition of "individual and other appropriate systems" could be revisited and considered as an alternative sanitation solution. Wastewater treatment facilities with secondary treatment tend to have significant O&M costs that need to be covered by wastewater system users. In some situations, extensive "nature near" ecological WWTP solutions (such as constructed wetlands or lagoons) may be favored because they have significantly lower O&M costs and can achieve required level of pollution reduction with smaller per PE costs. Development of a modular conception of WWTPs may also help in reducing O&M costs, through allowing use of part of the treatment plant depending on received load (e.g., in situations of major load variations, as in seasonal tourist areas).

Promote reuse and circular economy. Member states should explore possibilities to increase benefits from UWWTD implementation. For instance, the wastewater sector can contribute to promoting a greener circular economy, which remains largely untapped. First, improve the management of sludge from WWTPs, gradually increasing the amount recycled in biogas production or in agriculture, provided that heavy metal concentration is below EU Sludge Directive thresholds (86/278/EEC of June 12, 1986) and that a clear traceability is implemented. Second, develop the potential benefits of water-related tourism in protected rural areas, which often lack economic development opportunities. Finally, promote wastewater reuse in areas expected to be most affected by climate change, and where high pumping costs currently make irrigation not economically viable (the European Commission has recently adopted a proposal for water reuse).

Chapter 5 Conclusions

This limited review of wastewater management in Danube region under European Union (EU) water policies shows that, despite several challenges, the UWWTD has indeed delivered results for the people and environment in Danube region. The share of wastewater treated according to the Urban Wastewater Treatment Directive (UWWTD) requirements has shown major improvement since 2004, demonstrating the impact of massive investment efforts. As a result, in the past 20 years, there has been a noticeable emission reduction of organic pollutants and nutrients. Continued improvement can be expected proportional to an increase in compliance with UWWTD and other relevant water directives in newer Danube River Basin (DRB) member states.

The review points out several challenges associated with implementing the UWWTD. Implementation capacity, key for optimal development of wastewater infrastructure and better absorption of EU funds, is often neglected and insufficiently prepared. Necessary tariff increases, which are a consequence of investment in new infrastructure and related O&M cost increases, trigger affordability issues for the bottom 40 (B40) percent of population in some countries, prompting a need to develop adequate subsidy and transfer mechanisms. The lack of necessary sectoral institutional reforms or sectoral adjustments to prepare for a large investment cycle has resulted in lower than planned absorption of available funds and delays in UWWTD compliance, triggering potential infringement procedures.

These challenges represent opportunities in implementing the current Directive within and beyond member states and its potential review. The current implementation could be made more efficient using sound economic appraisal to prioritize investments according to their cost-effectiveness while maintaining public health and environmental benefits and achievement of Water Framework Directive (WFD) objectives. Candidate countries can learn from recent EU members and address relevant challenges before accession. Finally, an evaluation of the Directive could consider providing more flexibility to member states to optimize their urban wastewater policies by making use of cost-effective measures, thus offering ways to improve the UWWTD's economic efficiency.

This note is meant to spur discussion—not provide all answers—because substantive work is still needed. Given the limits of available data regarding wastewater discharges, emissions, investments, and water quality in the DRB, further work is needed to improve the assessment of the impact of the UWWTD implementation on surface water quality, public health, and other social and environmental benefits. Attempts to provide more flexibility in implementing the Directive requires stronger institutional capacity, given the need for reliable data and sound modeling, to ensure the impact remains positive.

As the Danube region continues to converge with the rest of Europe, considering its particularities will benefit all parties. The Danube region—new member states and candidate countries—have demonstrated a strong commitment to meet the European acquis communautaire, ensure the health of their citizens, and protect and improve the quality of their water bodies. The ongoing implementation of the UWWTD, the accession negotiations with candidate countries, and the review of the Directive offer opportunities for governments and the Commission to learn from past challenges and consider the region's socioeconomic and environmental reality as they develop the policies, plans, and investment programs necessary to meet the European wastewater management standards.

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