

FINANCIAL SUSTAINABILITY OF WASTEWATER MANAGEMENT IN THE DANUBE REGION: FRAMING THE ISSUE



FEBRUARY 3, 2022

RADOSLAV RUSSEV (CONSULTANT)

SUGGESTED FRAME



- **Compliance** (key word in the last 30 years)
- Financing the Investment Needs
- Affordability
- Sustainability
- Other aspects

COMPLIANCE

COMPLIANCE: SCOPE

Table 3: Distribution of agglomerations and population equivalents in the DRB according to size classes (reference year: 2018)

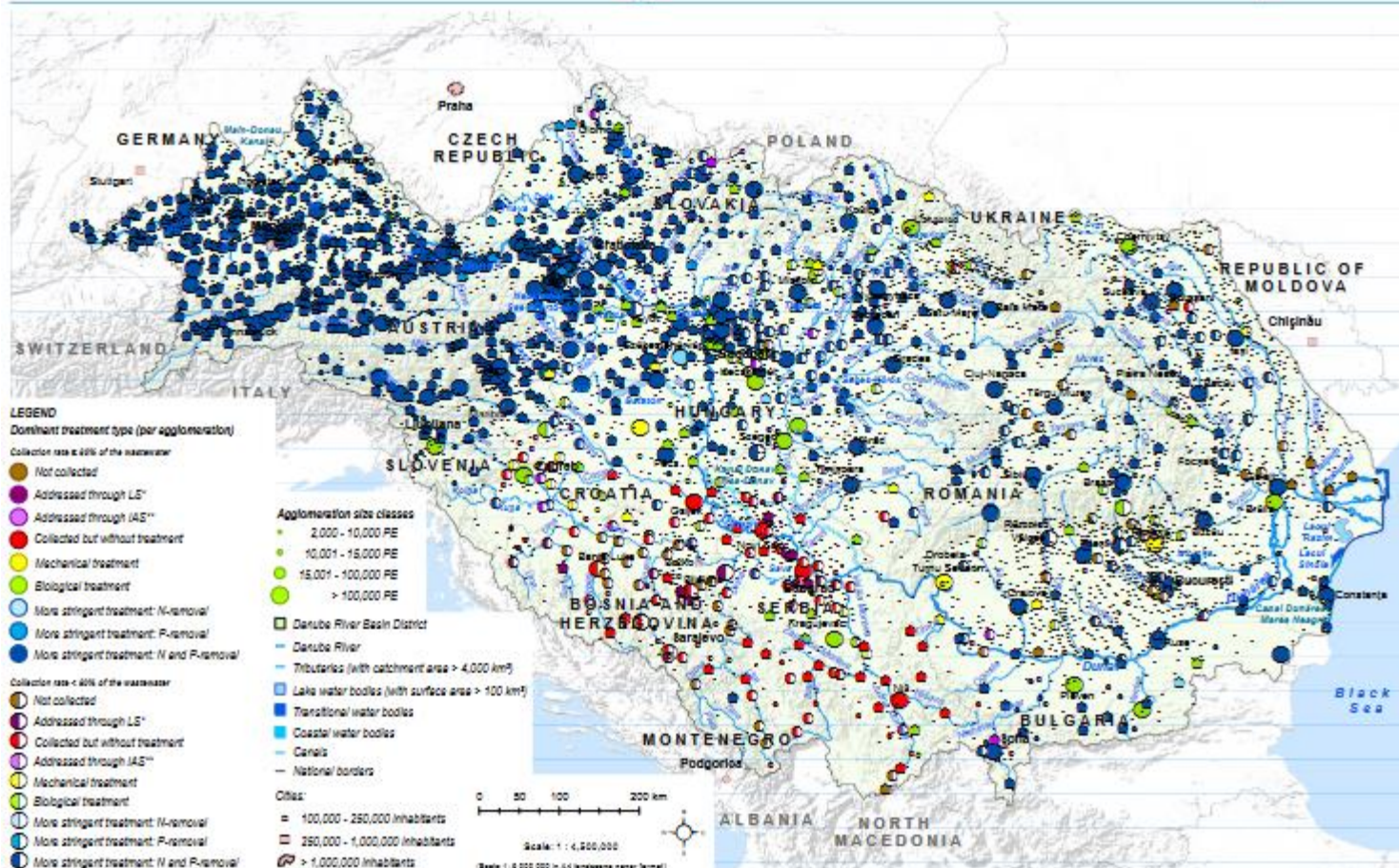
Size classes (PE)	Agglomerations		Population Equivalents (PE)	
	number	%	number	%
2,000 – 10,000	4,381	78	17.62 Mio	21
10,000 – 100,000	1,142	20	31.23 Mio	37
≥ 100,000	113	2	36.32 Mio	42
Total	5,636		85.17 Mio	

*Source: Danube River Basin
Management Plan (DRBMP), 2021
Update*

COMPLIANCE: SCOPE (CONTINUED)

Urban Wastewater Collection and Treatment – Dominant type: Reference Situation 2018

DRBMP Update 2021 - MAP 5



Source:
DRBMP, 2021
Update

* LS: Local Systems used for wastewater collection and local treatment (septic tanks, small domestic wastewater treatment plants, waterright tanks). LS are applicable only for non-EU Member States.

** IAS: Individual and other appropriate Systems as defined by the UN/WTO (septic tanks with drain fields, small domestic wastewater treatment plants, waterright tanks).

This ICPRD product is based on national information provided by the Contracting Parties to the ICPRD (AT, BE, BG, CH, CZ, DE, FR, GR, HU, IT, MD, ME, RO, RS, SI, SK, UA, and UK). EuroGlobalMap data from EuroGeographics has been used for all national borders except for AL, BG, MD, ME, and PL where the data from the 2017 World Countries has been used. Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System has been used as elevation data (DEM) data from the European Commission (Copernicus Research Center) has been used for the outer border of the DRBMP of AL, IT, ME and PL.

COMPLIANCE: LEVEL OF TREATMENT

Table 5: Generated urban wastewater load and number of centralized collection and treatment systems in the Danube River Basin (reference year: 2018)

Type of collection and treatment system			Generated load (PE)	Number of centralized collection and treatment systems
Collected by sewer	Collected by sewer and treated in UWWTP	Tertiary treatment	54,345,005	2,220
		Secondary treatment	7,264,840	888
		Primary treatment	1,155,336	100
	Collected but not treated		5,492,920	751
Not collected by sewer	Individually collected and treated	IAS	3,487,062	-
		Local systems	2,750,534	-
	Not collected		10,669,765	-
Total			85,165,464	3,959

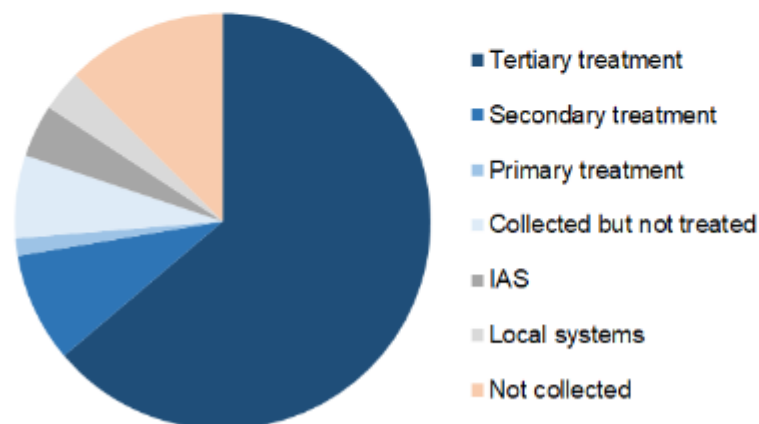


Figure 6: Share of the collection and treatment stages in the total population equivalents (PE) in the Danube River Basin (reference year: 2018)

Source:
DRBMP, 2021
Update

SCOPE OF COMPLIANCE: DYNAMIC TRACKING EXAMPLE

[https://uwwtd.eu/\(country_name\)/stats/summary](https://uwwtd.eu/(country_name)/stats/summary)

Bulgaria has 29.7% of its generated load compliant to the Urban Waste Water Treatment Directive (91/271/EEC).

Romania has 12.4% of its generated load compliant to the Urban Waste Water Treatment Directive (91/271/EEC).

Austria has 100% of its generated load compliant to the Urban Waste Water Treatment Directive (91/271/EEC).

FINANCIALS

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

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

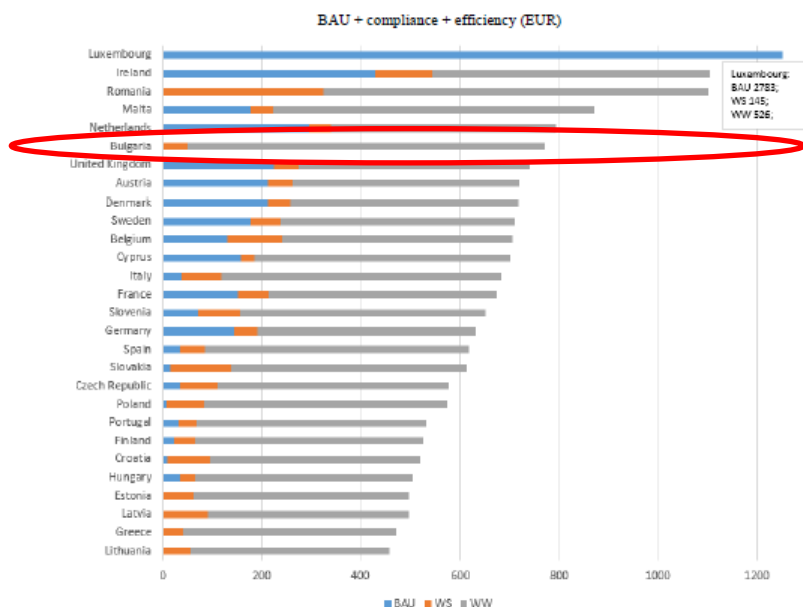
DECEMBER 2018

The investment required to reach full compliance with the UWWTD for the 27 Member States and the UK comes to a cumulative additional total of EUR 253 billion between 2020 and 2030.

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

**Tenth report on the implementation status and programmes for implementation (as
required by Article 17 of Council Directive 91/271/EEC, concerning urban waste water
treatment)**

INVESTMENT NEEDS: WS + WW



Source: OECD analysis based on European Commission and Eurostat data.

Explanation of scenarios:

- the BAU scenario (business-as-usual) captures what should be spent by 2030 with population growth
- the WS scenario (water supply) captures what should be spent by 2030 to meet the requirements of the recast DWD
- the WW scenario (waste water) captures what should be spent by 2030 to meet the requirements of the UWWTD

Fig – 10 Additional expenditures by 2030 per capita for waste water (ww) and drinking water systems (ws) [EUR/inhabitant] Source: OECD (2020)

Bulgaria: (almost) EUR 800 per capita needed between 2020 and 2030. Almost all of that is WW.

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Tenth report on the implementation status and programmes for implementation (as required by Article 17 of Council Directive 91/271/EEC, concerning urban waste water treatment)

INVESTMENT NEEDS: WW ONLY (PER YEAR)

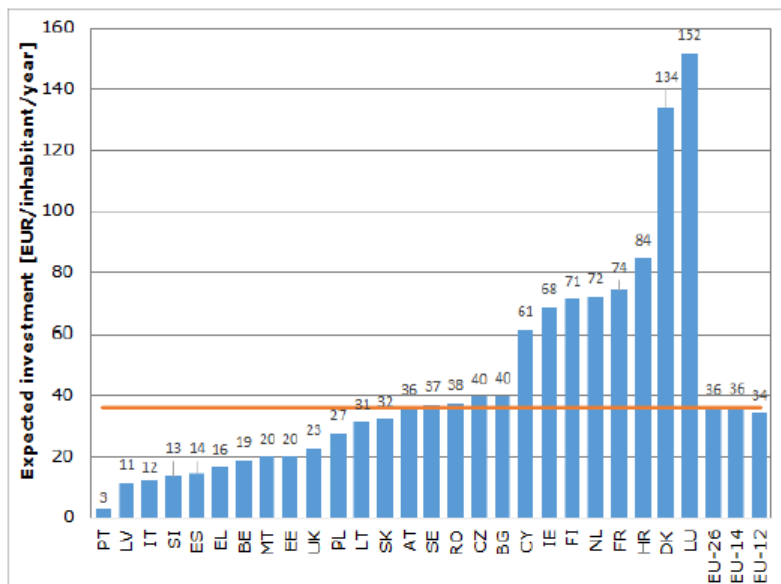


Fig – 9 Member States' programmes for implementation – expected annual investment costs per capita for installing and renewing waste water collecting systems and treatment plants [EUR/inhabitant/year]

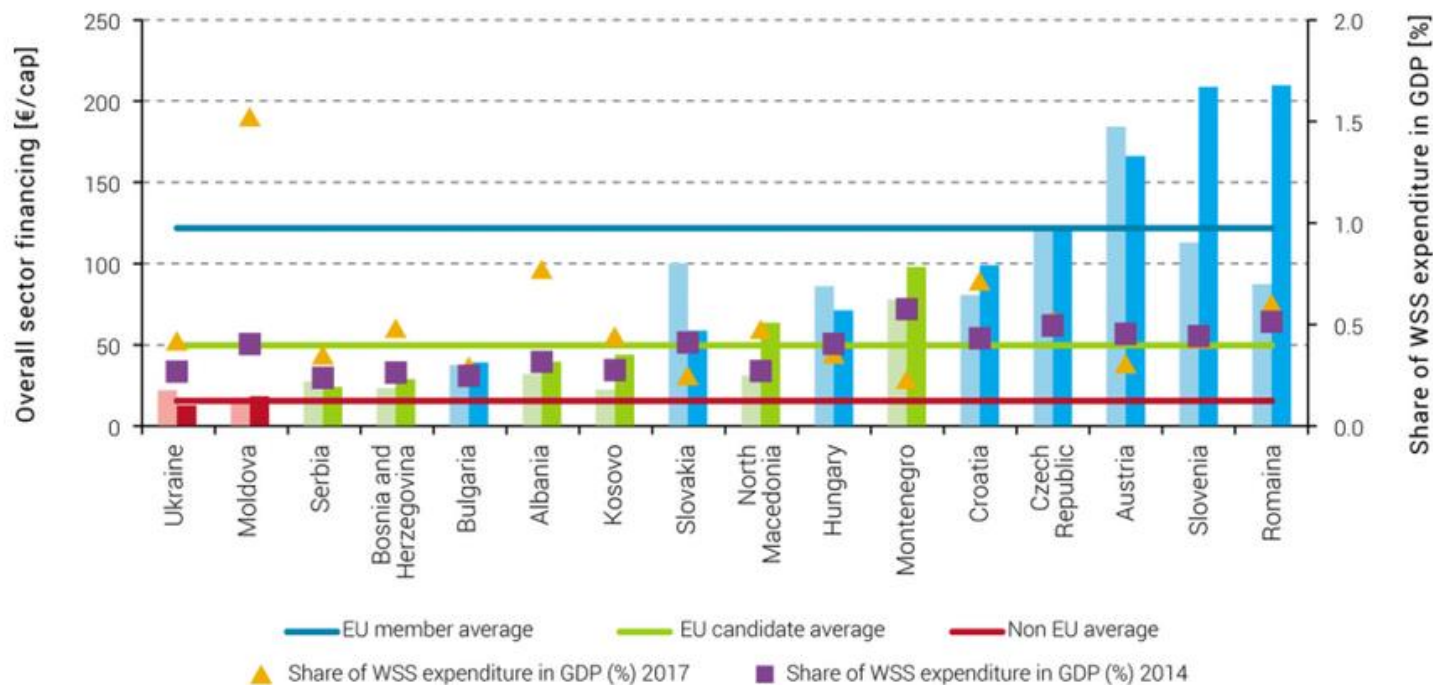
Note: Germany and Hungary did not provide any data on expected investments.
The orange line running across the graph is the average annual expected investment cost in the EU.

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Tenth report on the implementation status and programmes for implementation (as required by Article 17 of Council Directive 91/271/EEC, concerning urban waste water treatment)

SECTOR FINANCING AS % OF GDP

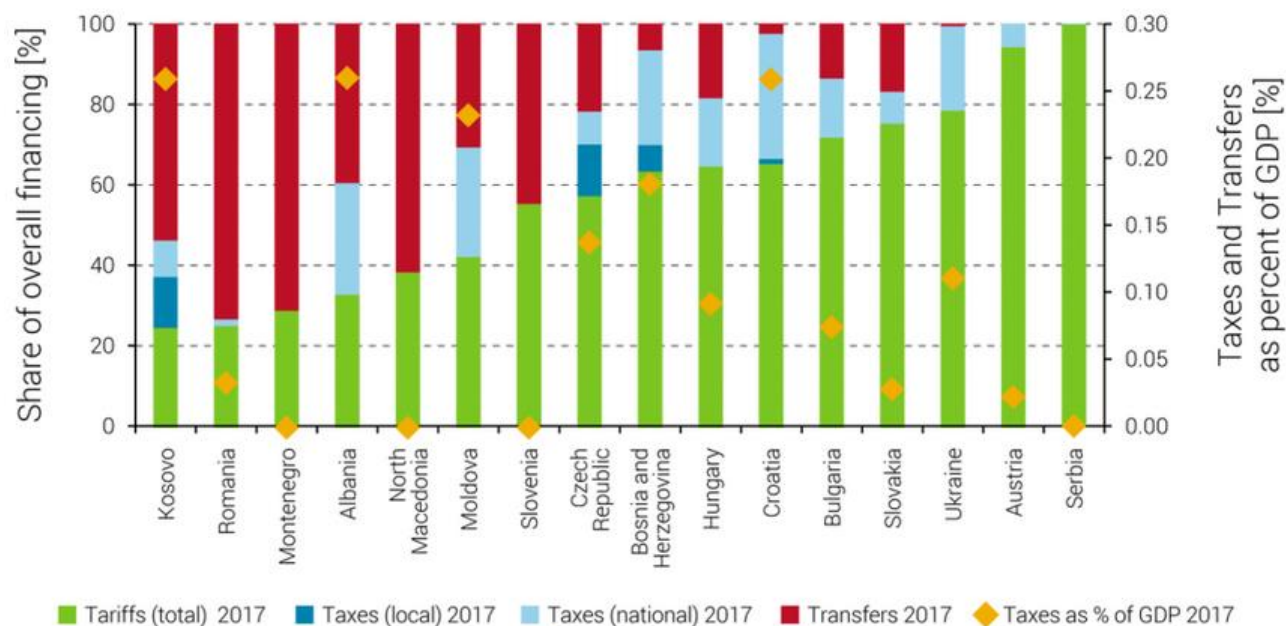
FIGURE 52: SECTOR FINANCING ACROSS COUNTRIES OF THE REGION IN PER CAPITA AND PERCENTAGE OF GDP



*State of the Sector Report,
DWP 2019*

SECTOR FINANCING: TARIFFS, TAXES, TRANSFERS

FIGURE 53: PROPORTION OF SECTOR FINANCING FROM TARIFFS, TAXES, AND TRANSFERS IN THE COUNTRIES OF THE DANUBE REGION



*State of the Sector Report,
DWP 2019*

SECTOR FINANCING: EU FUNDS USED

TABLE 15: EU FUNDS USED TO CO-FINANCE INVESTMENTS IN WASTEWATER INFRASTRUCTURE IN DANUBE RIVER BASIN EU MEMBER STATES (2000–2020) IN MILLION EUROS

Target countries	2000–2006 ISPA, ERDF	2007–2015 CF, ERDF	2014–2020 Budgets CF, ERDF	Total EU contribution
Bulgaria	246	1,122	1,000	2,368
Czech Republic	397	229	0	626
Croatia*	21	200	1,100*	1,321
Hungary	493	410	900	1,803
Romania	1,044	2,382	3,810*	7,236
Slovenia	117	351	250	718
Slovakia	259	546	200	1,005
Total Danube Region	2,577	5,240	7,260	15,077

SOURCE: THE WORLD BANK 2018B.

*State of the Sector Report,
DWP 2019*

SPECIAL FOCUS (OF GOVERNMENTS): ABSORPTION

22.06.2020 г.

Към края на юни 2020 г. по Оперативна програма „Околна среда“ (ОПОС) са обявени 56 процедури на обща стойност 4,3 млрд. лв. Това представлява 124% от ресурса на програмата. С цел пълно усвояване с решение от 13 март 2020 г. Министерският съвет даде съгласие на Управляващия орган на ОПОС 2014-2020 г. да сключва договори за предоставяне на безвъзмездна финансова помощ в размер до 20 на сто над бюджета на програмата.

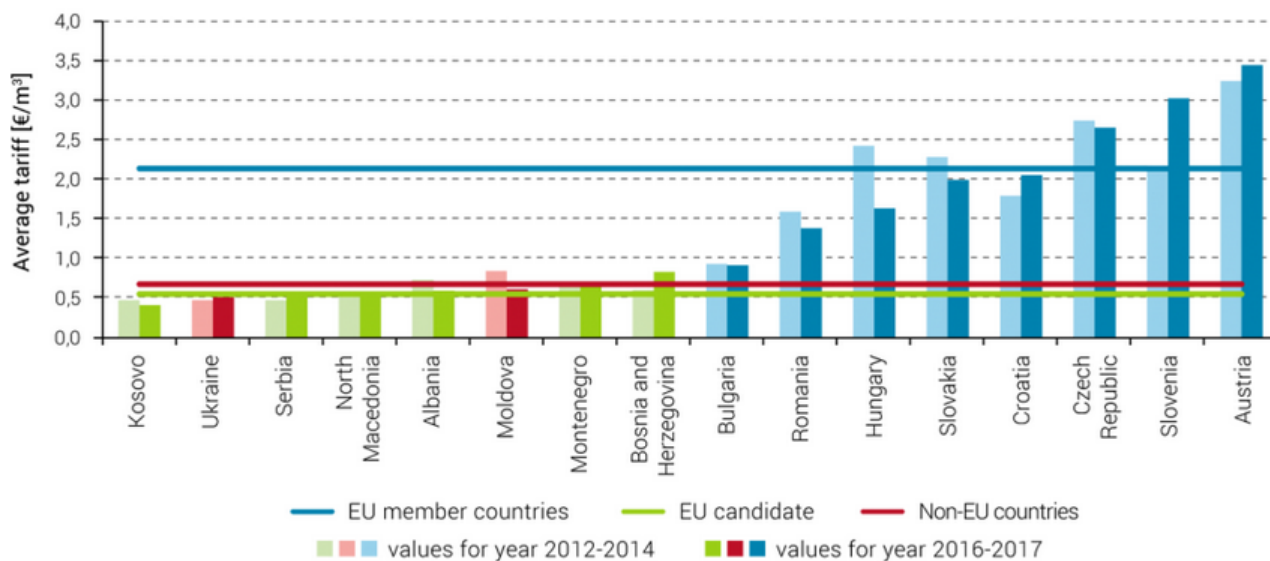
Translation:

... BGN 4.3 billion (EUR 2.2 billion) ... equal to 124% of the total value (limit) of the program. A decision of the Council of Ministers for OPE 2014 – 2020 for contracting up to 20% above the OPE limit

<https://www.eufunds.bg/bg/opus/node/4872>

RESIDENTIAL TARIFFS

FIGURE 58: RESIDENTIAL TARIFFS (WATER AND WASTEWATER) IN THE COUNTRIES OF THE REGION



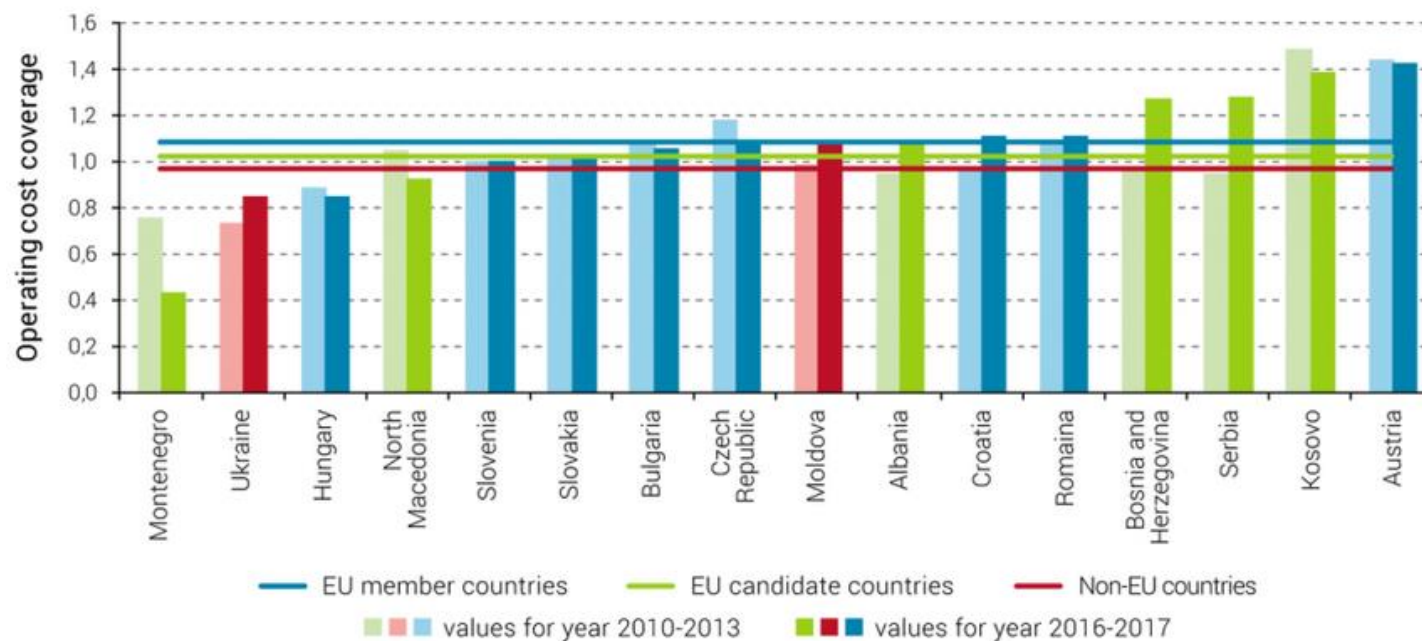
SOURCE: AUTHOR'S ELABORATION BASED ON EURO DATA COLLECTION

*State of the Sector Report,
DWP 2019*

SUSTAINABILITY

OPERATING COST COVERAGE

FIGURE 59: OPERATING COST COVERAGE IN COUNTRIES OF THE REGION (BILLED OPERATIONAL REVENUE/OPERATING COSTS)

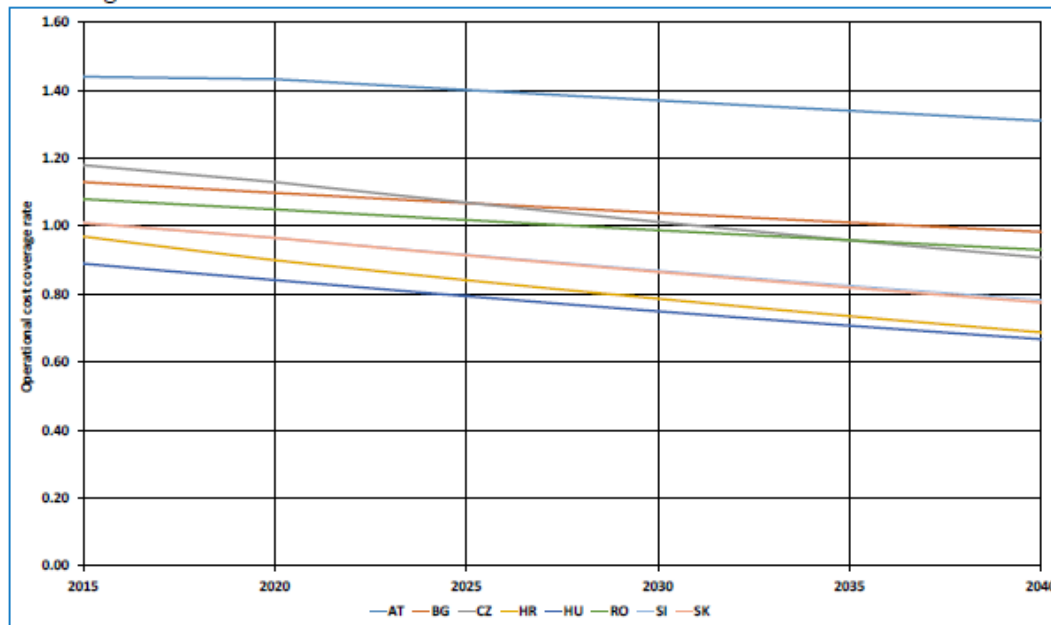


*State of the Sector Report,
DWP 2019*

- **OCR: Operational Cost Recovery**
- **TCR: Total Cost Recovery** (investment + reinvestment inc. financial costs)
- **BAU: Business as Usual**
- **SOP: Sustainability Oriented Pathway** (overoptimistic)

*Wastewater Management in the
Danube Region, 2017 Report*

OPERATIONAL CR: BUSINESS AS USUAL

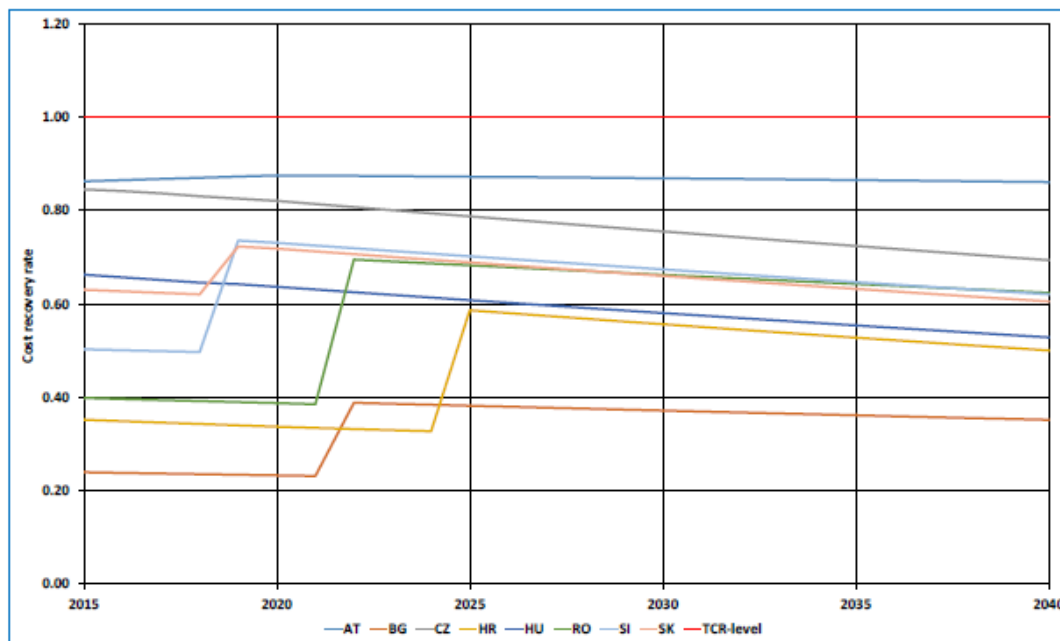


Source: SOS Report 2015; Own assessment

Figure 3.1: Long-term evolution of OCR ratios in countries in the Danube region – BAU Scenario

*Wastewater Management in the
Danube Region, 2017 Report*

TOTAL COST RECOVERY: BUSINESS AS USUAL

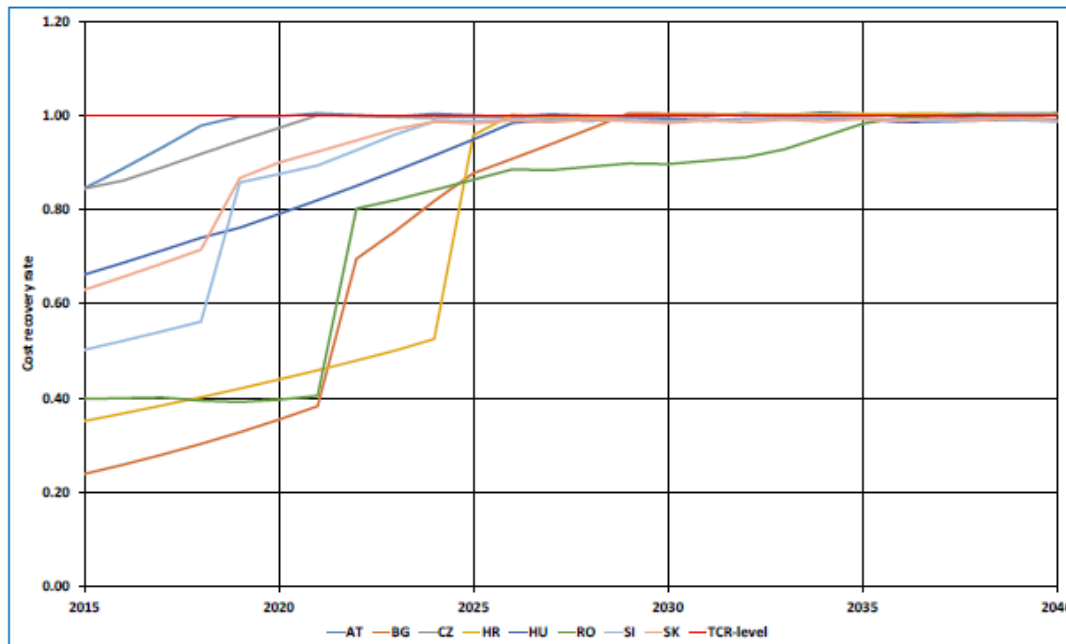


Source: SOS Report 2015, Own assessment

Figure 3.2: Long-term evolution of TCR ratios in countries in the Danube region – BAU scenario

*Wastewater Management in the
Danube Region, 2017 Report*

TOTAL COST RECOVERY: SOP SCENARIO



Source: SOS Report 2015, own assessment

Figure 3.4: Long-term evolution of TCR ratios by countries of the Danube region – SOP scenario

- CZ: 7-year annual 5% increase above inflation, after that – 2% (above inflation)
- AT: 5-year annual 5% increase...
- BG: 5% annual increase over 15 years. The WW tariff by 2040 to be EUR 1.3 / m³

*Wastewater Management in the
Danube Region, 2017 Report*

INVESTMENT VS. REINVESTMENT

INVESTMENT NEEDS (TO REACH COMPLIANCE)

Target Countries	Total Investment Cost per PE			Country Population Density	Share of rural* population in country %
	Total	Sewer network	WWTP		
Austria	710	501	209	103	34
Bulgaria	724	517	207	65	26
Czech Republic	876	652	224	134	27
Croatia	810	611	199	74	41
Hungary	668	547	121	106	29
Romania	830	620	210	86	45
Slovenia	951	726	225	102	50
Slovakia	832	611	221	111	46
Average Danube Region	771	572	199	94	37

Source: Own calculations, *World Bank database on rural population per countries

Table 3.9: Specific investment cost per PE to achieve UWWTD compliance in the Danube region

*State of the Sector Report,
DWP 2019*

REINVESTMENT NEEDS

Target Countries	Reinvestment need on historical installations, M EUR		Reinvestment need on future installations, M EUR		Total annual reinvestment need, M EUR	Total Initial Investment values, M EUR
	Sewer network	WWTP	Sewer network	WWTP		
Austria	203	212	0	0	415	14,388
Bulgaria	67	41	16	43	167	5,849
Czech Republic	94	80	0	1	174	6,286
Croatia	0	0	61	19	81	3,459
Hungary	112	61	0	1	173	6,825
Romania	117	50	141	169	476	17,252
Slovenia	18	4	2	11	35	1,304
Slovakia	47	29	0	14	90	3,236
Danube Region	658	476	221	258	1,613	58,599

Source: 9th TA-UWWTD; Own assessment

Table 3.10: Calculated Reinvestment Need for Sustained Compliance with UWWTD

*State of the Sector Report,
DWP 2019*

SIMPLIFIED CALCULATIONS (EXAMPLE OF BULGARIA)

- EUR 167 000 000: Annual Reinvestment Need (Sewerage + WWTP)
- $167\,000\,000 / 7\,000\,000$ (population) = EUR 24 per person per year (only reinvestment; only sanitation)
- EUR 2 per person per month
- 3 m³ per person per month @ EUR 1.2 (current situation)
- EUR 0.6 per m³/person needs to be included in the tariff (only for reinvestment; only for sanitation)

THE CASE OF DOBRICH WATER

- Regional water operator with 6 WWTPs (one above PE 75 000, two in the range PE 30 000 – 50 000, three smaller)
- Book Value of “wastewater treatment assets” below EUR 10 million.
Replacement value: at least EUR 70 million (based on EUR 500 per capita).
- Annual (permitted) depreciation in the tariff: EUR 350 000 per year
- Actual investment: below EUR 200 000 per year

Three major issues:

- (Re)valuation of assets built 30-40 years ago!
- Regulatory limits of permissible depreciation in the tariff
- Actual impossibility to invest

*Dobrich Water 5-year BP
submission*

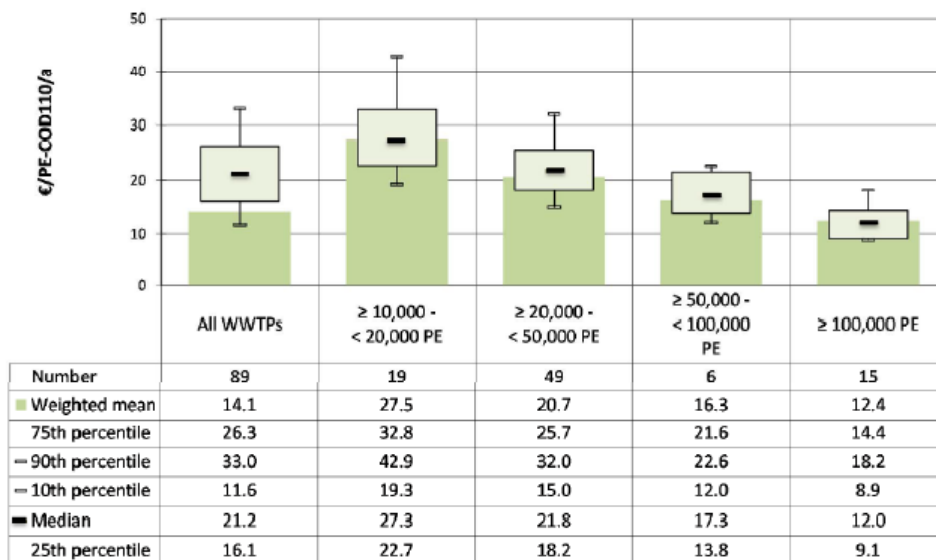
OTHER ASPECTS (OF FIN. SUSTAINABILITY)

WHAT ELSE TO BE CONSIDERED

- OPEX Structure
- Rural Areas & Individual Appropriate Solutions (IAS)
- Evolution of UWWTD
- Methane Capture & CHPs

OPEX STRUCTURE OF WWTP O&M

RESULTS - Operating costs & WWTP size nexus



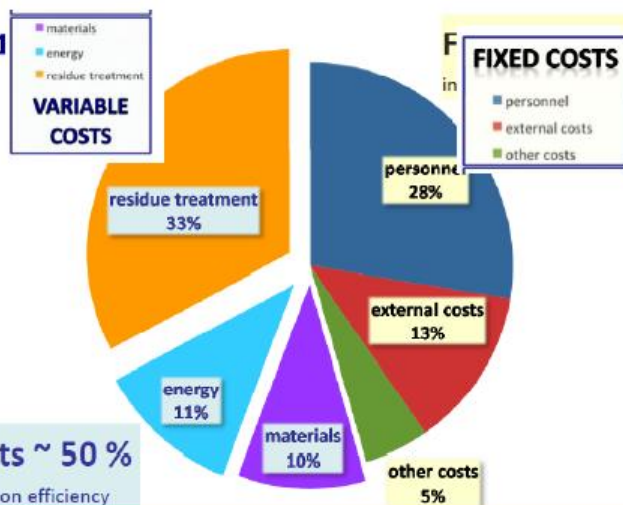
Data base: benchmarking period 2003 – 2011; mean for WWTP that participated more than once

*Wastewater Management in the
Danube Region, 2017 Report*

OPEX STRUCTURE OF WWTP O&M (CONTINUED)

RESULTS Operating costs attributed to cost categories

84 WWTPs ≥ 1



Variable Costs ~ 50 %
depending on utilisation efficiency

Electricity prices have gone up 2-3 times in SEE/CEE markets with liberalized energy markets in 2021.

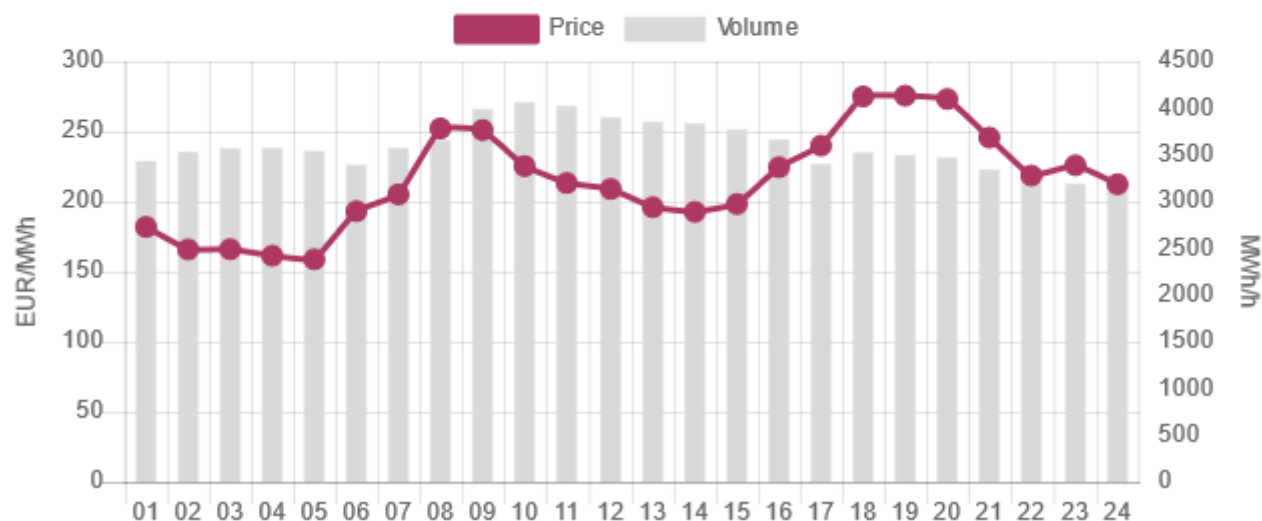
Wastewater Management in the Danube Region, 2017 Report

ENERGY PRICES (TODAY)

Average
215.02 EUR/M
Wh *

Total Volume
86
363.40 MWh

Delivery Day: 03.02.2022, Delivery time: CET



ELECTRICITY CONSUMPTION AND IMPACT ON OVERALL OPEX

Selected indicators	Utility		Danube Hub	Database
	Value	Yearly change	Average	Average
* a lower value implies better performance.				
wOp-018 - WWT energy consumption (kWh/PE served by WWTP) *	24.26	-16.56%	50.51	45.41

- 50 KWh/PE * EUR 0,06 = 3 EUR
- 50 KWh/PE * EUR 0,20 = 10 EUR

*Utility Benchmarking Report,
2021 Data*

RURAL POPULATION

Table 1: Demographic characteristics of examined countries.

Country	Population	Settlements < 2000 PE (%)	Population in settlements < 2000 PE (%)
Bulgaria	6,888,147	90%	26%
Croatia	4,284,889	97%	39%
Estonia	1,300,000	99%	31%
Hungary	9,890,640	75%	17%
Latvia	1,900,000	91%	43%
Moldova	2034100	33%	no data
Montenegro	621,700	98%	20%
Poland	37,660,000	no data	27%
Romania	19,186,201	38%	10%
Slovakia	5,459,781	85%	30%
Slovenia	2,108,977	98%	52%
Ukraine	41,342,500	95%	32%
average			30%

Wastewater collection, treatment and reuse in rural areas of CEE, GWP CEE Report, 2021

WS VS. WW TREATMENT

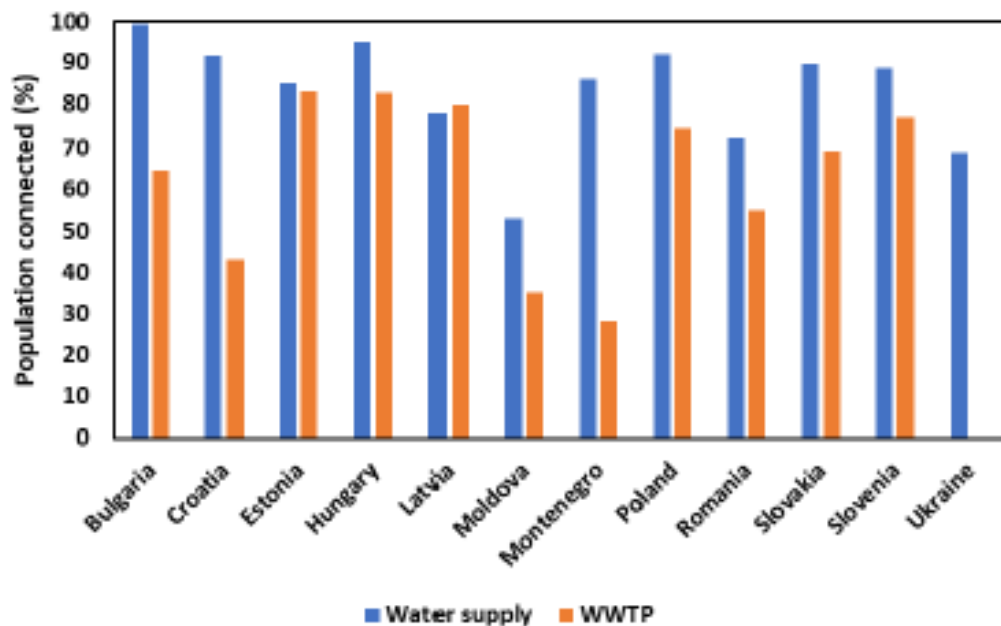


Figure 2: Population connected to public water supply and public wastewater treatment plants in investigated countries.

Wastewater collection, treatment and reuse in rural areas of CEE, GWP CEE Report, 2021

RURAL POPULATION: ADOPTION OF IAS

Table 5: The presence of nature-based solutions (marked green) in the countries of Central and Eastern Europe. Where the data were available also the number of systems is given.

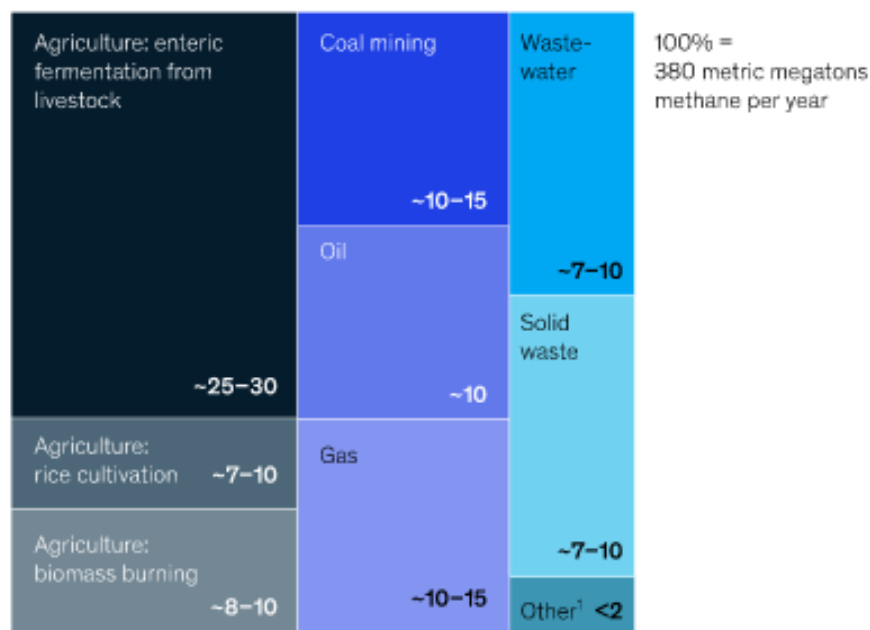
	Bulgaria	Croatia	Estonia	Hungary	Latvia	Moldova	Montenegro	Poland	Romania	Slovakia	Slovenia	Ukraine	Total
Soil infiltration				12								300	>312
Willow systems											1		>1
Waste stabilization ponds				3							2		>5
Aerated ponds											10		>10
Treatment wetlands		8				7	5	8,000		150	180	80	>10,430
Sludge treatment reed beds		8			10		4	1					>23
Vermifilter						1							1
Ecosan technology						70							70

Wastewater collection, treatment and reuse in rural areas of CEE, GWP CEE Report, 2021

METHANE IMPACT

Methane from human activity is emitted by five key industries: oil and gas, coal, agriculture, solid waste, and wastewater.

Global methane emissions from human activities, % share



1. *Other* includes industry and vehicle transport emissions.

Source: Marielle Saunels et al, "The global methane budget 2000-2017," *Earth System Science Data*, 2020.

METHANE CAPTURE & CHPS



Sofia Water, Bulgaria: 120% of energy needs of WWTP Kubratovo covered by on-site generation within a CHP plant.

FINAL WORDS

Underestimated Reinvestment

component in the tariffs is the elephant in the room but let's not ignore other important aspects (varying OPEX structures, electricity prices, solutions for rural areas, revenue opportunities)

