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Small wastewater treatment facilities: CEE countries and Slovak experience



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EU4Environment

Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova, Ukraine

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Global Water Partnership – Central and Eastern Europe



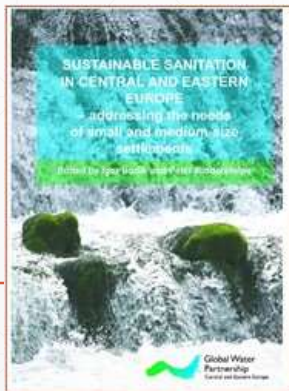
GWP Central and Eastern Europe was established in 1998 and it is an international network of organizations involved in water resources management.

GWP CEE's international network comprises 12 Country Water Partnerships (CWPs) in Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia and Ukraine with more than 170 partner organizations from different sectors.

<https://www.gwp.org/en/GWP-CEE/>

GWP CEE Sustainable sanitation activities

- 2002 – GWP CEE Start of national sustainable sanitation activities
- 2004 – GWP CEE Sustainable Sanitation Task Force founded
- 2007 – Sustainable Sanitation in CEE – addressing the needs of small and medium-size settlements (book in 12 languages)
- 2012 - Natural processes of wastewater treatment – actual status in CEE countries (Questionnaire study).
- 2014 – Natural Technologies of Wastewater Treatment (book)
- 2021 - Wastewater collection, treatment, and reuse in rural areas of Central and Eastern Europe (Questionnaire study).



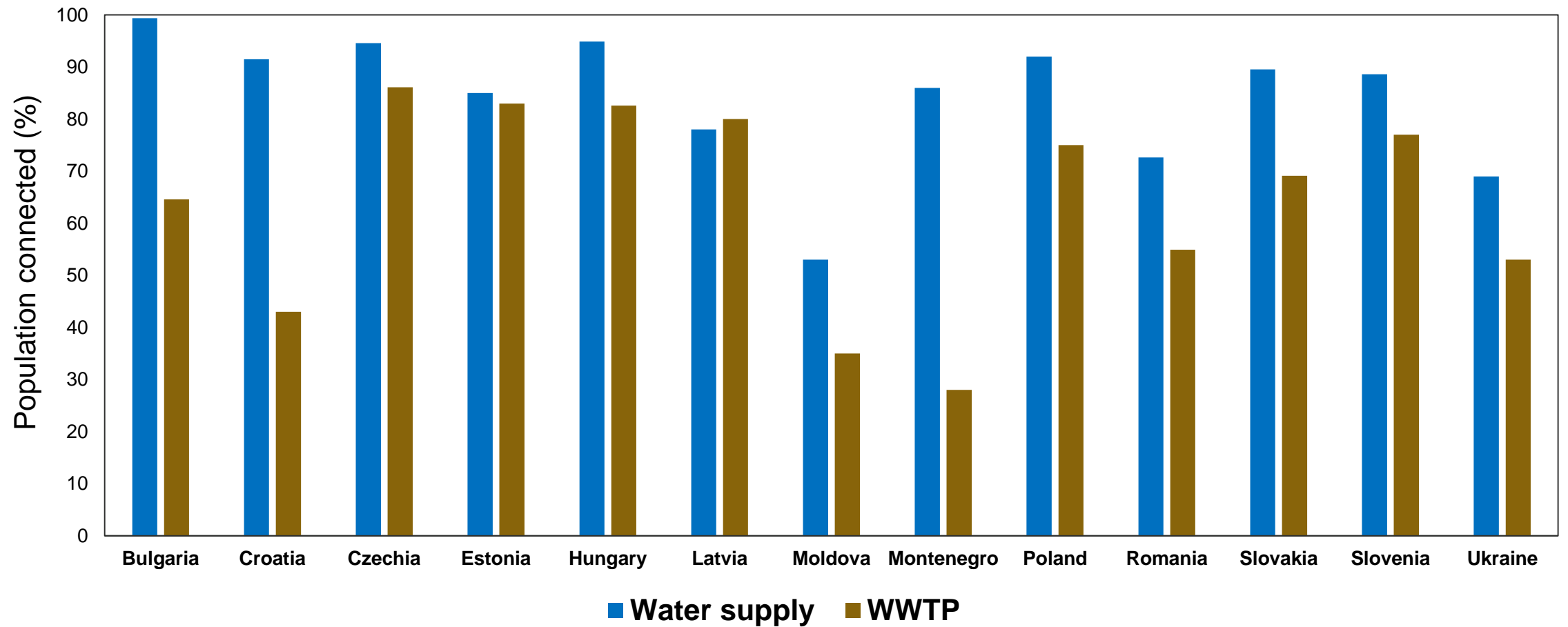
Central and Eastern Europe – Demography

Country	Population (1000x)	Settlements < 2000 PE (%)	Population in settlements < 2000 PE (%)	Population in settlements < 2000 PE (1000x)
Bulgaria	6 888	90%	26%	1 790
Croatia	4 285	97%	39%	1 664
Czechia	10 703	90%	27%	2 885
Estonia	1 300	99%	31%	401
Hungary	9 890	75%	17%	1 658
Latvia	1 900	91%	43%	820
Moldova	2 034	33%	n.d.	n.d.
Montenegro	621	98%	20%	125
Poland	37 660	n.d.	27%	10 000
Romania	19 186	38%	10%	1 915
Slovakia	5 459	85%	30%	1 645
Slovenia	2 108	98%	52%	1 087
Ukraine	41 342	95%	32%	13 093
Total	143 380	92%	30%	37 300

Population connected on WWTPs in small settlements

	Total number of inhabitants living in settlements < 2000	Total number of inhabitants connected to WWTP < 2000 PE	Ratio of connected population in small settlements
Bulgaria	1 762 153	No data	-
Croatia	1 664 400	19,669	1%
Czechia	2 850 000	1 250 000	44%
Estonia	401 014	102,000	25%
Hungary	1 658 304	738,477	45%
Latvia	820 000	90,000	11%
Moldova		No data	-
Montenegro	125 000	2,500	2%
Poland	10 000 000	No data	-
Romania	1 915 072	156,598	8%
Slovakia	1 645 276	413,000	25%
Slovenia	1 086 815	No data	-
Ukraine	13 093 100	780,000	6%

Central and Eastern Europe – Connection to systems



WWTPs distribution according capacity

WWTP capacity (PE)						
	<50	50-2,000	2,000-10,000	10,000-100,000	>100,000	Total
Bulgaria	64		109			173
Croatia	1	80	54	55	5	195
Czechia						2 795
Estonia	96	429	39	18	6	588
Hungary	4254**	210**	380	197	21	808
Latvia	15	1,005	63	16	1	1 100
Moldova		>300	73	1		
Montenegro	No data	5	2	7	1	15
Poland	8,000*	No data	1,095	535	102	1 732
Romania	12	354	633	132	66	1 197
Slovakia	15,000*	441	236	74	6	757
Slovenia	No data	430	88	37	4	559
Ukraine		780	343	417	44	1 584

* estimated ** sum with septic tanks

Treatment technologies in CEE countries

PE<2000	Bulgaria	Croatia	Estonia	Hungary	Latvia	Moldova	Montenegro	Poland	Romania	Slovakia	Slovenia	Ukraine
Sequencing batch reactors (SBR)	1	-	2	2	3	-	1	2	2	1	1	3
Moving bed biofilm reactor (MBBR)	-	-	2	1	-	-	-	2	1	-	2	-
Membrane bioreactor (MBR)	-	-	-	-	-	-	-	-	2	1	1	-
Activated sludge system	-	-	2	-	-	-	-	-	-	3	-	-
Upflow anaer. sludge blanket (UASB)	-	-	-	-	-	-	-	-	1	-	1	-
Sand filter	1	-	2	-	-	2	-	-	2	1	-	-
Soil infiltration	-	-	1	1	-	2	-	-	-	1	1	2
Willow system	-	-	-	1	-	-	-	-	-	-	-	-
Waste stabilization ponds	-	-	-	-	-	-	-	-	-	-	1	-
Aerated/aerobic ponds	1	-	2	-	-	-	-	-	1	-	-	-
Treatment wetlands	-	2	1	-	-	2	2	1	-	-	1	1
Sludge treatment reed beds	-	2	-	-	1	1	2	-	1	-	1	-
Water-tight septic tank	1	-	1	-	-	1	2	-	0	1	2	2
Septic pits, burial pits	-	-	-	-	-	-	-	-	-	-	-	-

- never 1 – rarely 2 – often 3 - mostly

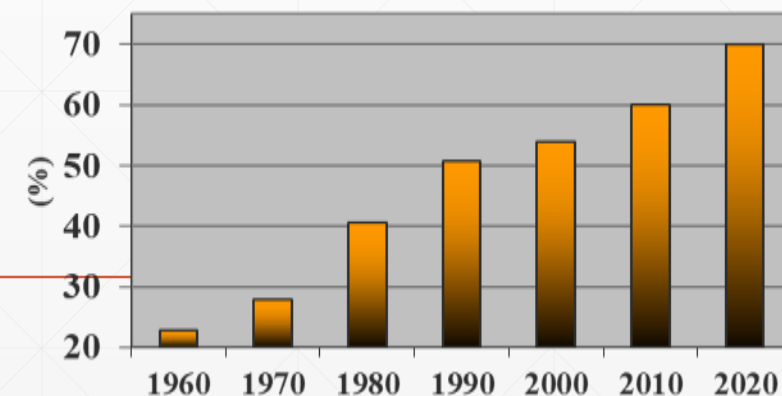
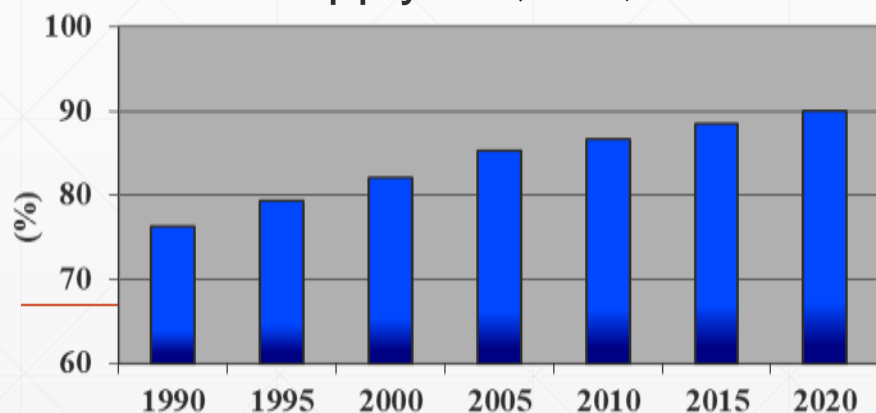
Discharge limits for small WWTPs < 2000 PE

Parameter (mg/l)	Bulgaria	Croatia	Estonia		Hungary			Latvia	Poland		Romania		Slovakia		Slovenia		Ukraine	
	All sizes	All sizes	PE<300	300<PE<2000	PE<50	PE<600	601<PE<2000	50<PE<2000	PE<50	50<PE<2000	PE<50	50<PE<2000	PE<50	50<PE<2000	PE<50	50<PE<2000	PE<50	50<PE<2000
COD	125	125	150	125	75-150	300	50-150	50-70%	150	125	125	135/170		200	150	80	80	
BOD	25	25	40	25		80	15-50	50-70%	20%	40	25	25	40 / 70	30/60	30	15	15	
TSS	35	35	35	35		100	35-200	<35	50%	50	60	60	30/60			15	15	
TN				60			20-55			30						0.39	0.39	
NH ₄ -N					10-40		2-20				3	3						
NO ₃ -N			45	45							37	37						
NO ₂ -N			0.1	0.1							2	2						
TP				2			0.7-10											
PO ₄ -P									5"		6	6						
Others							E-Coli				Cl ⁻ , detergents, phenols, sulphides							

Slovak Republic in water characteristics



- 5,4 Mil. inhabitants
- 2 890 settlements
- 2 512 settlements with < 2000 inhabitants = 1,6 Mil. inhabitants
- 90 % connection on public water supply
 - 80 % of drinking water from underground water reservoirs
 - 80 L/cap.day – daily water consumption (decrease from 190 L/cap.day in 1990y)
- 70 % connection on public sewerage systems
- Water supply – 1,0 -1,5 €/m³ – Wastewater treatment – 1,2 - 1,75 €/m³



Slovak Republic towards higher WS-WW connection

- 2004 – access to the European Union
 - Requirements for wastewater treatment goals
 - 2010 – biological WWTPs for all settlements above 10 000 PE (fulfilled in 2016)
 - 2015 – biological WWTPs for all settlements above 2 000 PE (not met yet...)
 - 2004 – 2020 EU investment funds for sewerage and WWTPs ca 2 billions €
 - Completely new water legislation (according to EU legislation but with SK specifics)
 - Emission and imission principle
 - Nitrogen and phosphorus removal
 - Increasing of prices (300 000 € per sewerage kilometer)
 - High level of wastewater research, cooperation between universities – water companies



Slovak Republic actual status in small WWTPs

- 2000 – 2015 focusing mainly on large WWTPs (90% financial support from EU)
 - ca. 400 000 individual houses without connection to sewerage and WWTP
 - Scattered positioning of family houses in the countryside
 - High investment cost to connection and treatment
 - No (low) government financial support
 - Sewage discharge without strict control
 - transferred control to municipalities
 - Low environmental awareness of rural population
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Slovak Republic towards small WWTPs development

Four models of actually statuses in small settlements under 2000 inhabitants

1. Small settlement is connected to large WWTP in near city
2. Small settlement has own WWTP
3. Small settlement has no own WWTP, and individual houses use own domestic WWTPs
4. Small settlement has no own WWTP, and individual houses use cesspools



Small settlement is connected to large WWTP in near city

- Agglomerations were created during preparation of EU projects
 - The agglomeration consisted of one or more municipalities
 - In the frame of one agglomeration small settlements were connected to sewerage and WWTP of larger city
 - Residents in settlement are required to connect to the sewer if it is within an economically accessible distance
 - economically accessible distance is not defined...
 - it is solved individually
 - No more EU funds for large WWTPs



Small settlement has own WWTP

- The preparation and construction of the treatment plant depends only on the initiative of the municipality (mayor)
- There are very limited funding from the government
 - Slovak Environment Fund
 - The goal is to connect more than 85 % of inhabitants in settlement
 - Residents in settlement are required to connect to the sewer if it is within an economically accessible distance
 - No more individual domestic WWTPs are allowed
 - No more individual cesspools (or septic tanks) are allowed



Small settlement with individual domestic WWTPs

- The construction of domestic WWTP is solely a citizen's initiative
- Currently, about 10 000 domestic WWTP are in operation (5 – 10 PE)
- Activated sludge systems predominate
- Natural WWTPs (CWs) are pushing very slowly (100 small CW's in operation)



Small settlement with individual cesspools

- No central sewerage is available
- Tight cesspools only acceptable
- Septic tanks (continually overflowed) as individual treatment step not allowed
- The municipality should provide the control of cesspool contents export
- The citizen is obliged to ensure the transport of cesspool contents to the nearest WWTP
 - No free capacity on WWTPs
 - Increasing of prices for discharge (up to 100 € per one legal emptying of 10 m³ per month)
 - Illegal discharge to near river, soil



References for downloads

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Thank you for your attention!!

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