ICPDR IKSD
International Commission for the Protection of the Danube River
Internationale Kommission zum Schutz der Donau

THE WORLD BANK
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IAWD DANUBE WATER PROGRAM
Smart policies, strong utilities, sustainable services

RURAL WASTEWATER TREATMENT WORKSHOP, JANUARY 19-20, 2021

BEYOND UTILITY REACH?

HOW TO CLOSE THE RURAL ACCESS GAP TO WASTEWATER TREATMENT AND SANITATION SERVICES

Personal Insights into Decentralized (NOT ONLY RURAL) Wastewater Management in Serbia and the DRB

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CONTENT

22,000,000 Without Flush Toilet in DRB???

WATER AND WASTEWATER SERVICES IN THE DANUBE REGION

A STATE OF THE SECTOR 2018 UPDATE

Report | June 2019

FIGURE 21: SHARE OF POPULATION WITH PIPED WATER IN DANUBE REGION, 2015

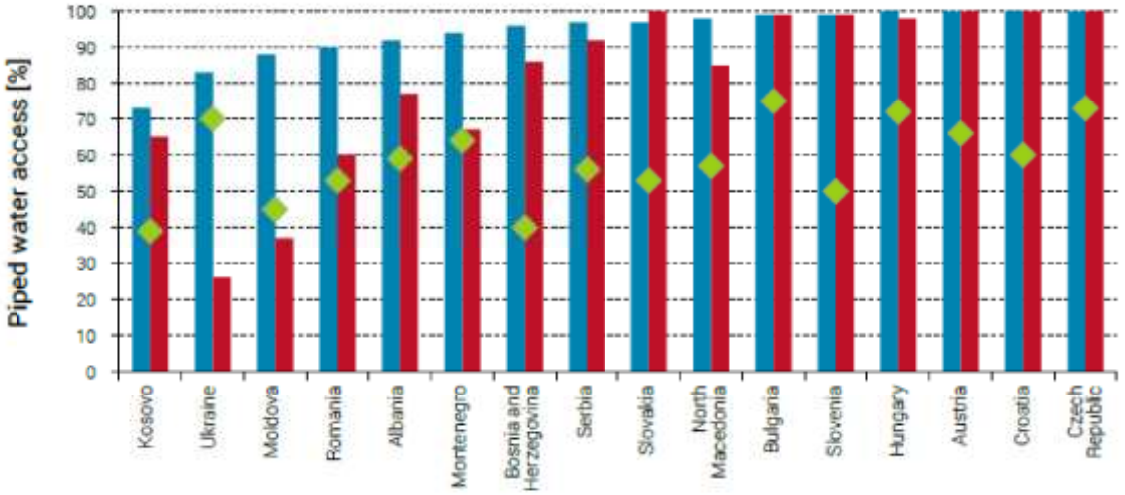
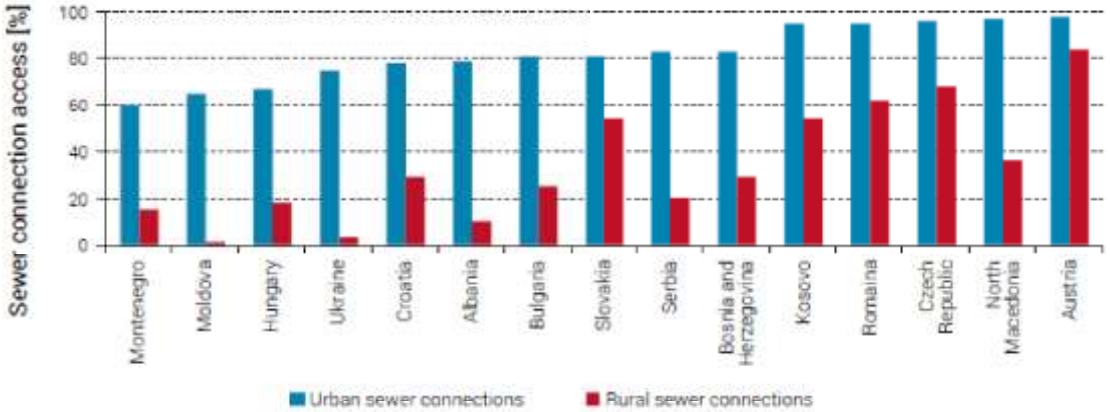
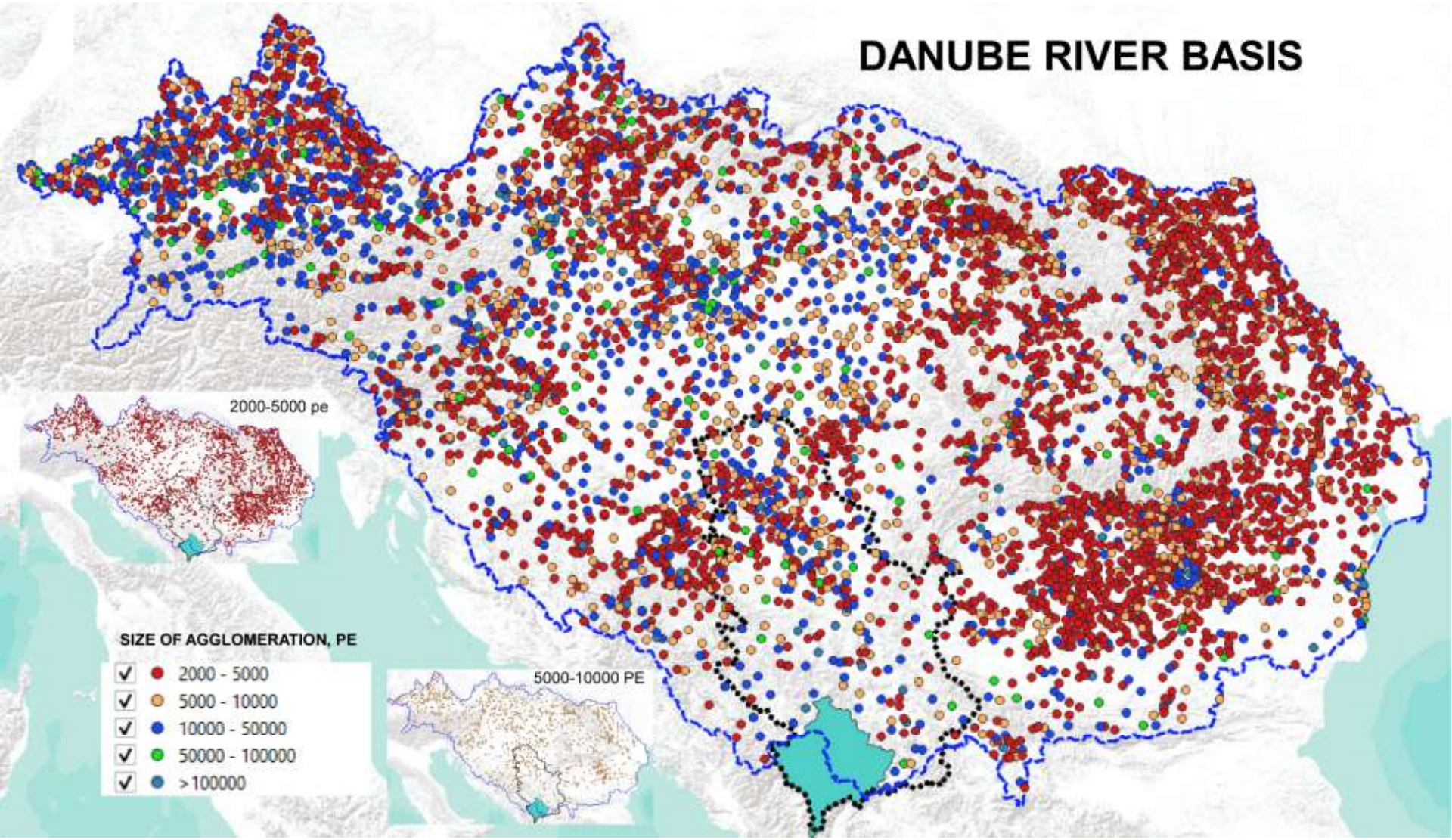


FIGURE 24: SHARE OF POPULATION WITH SEWER CONNECTIONS IN DANUBE REGION, 2015

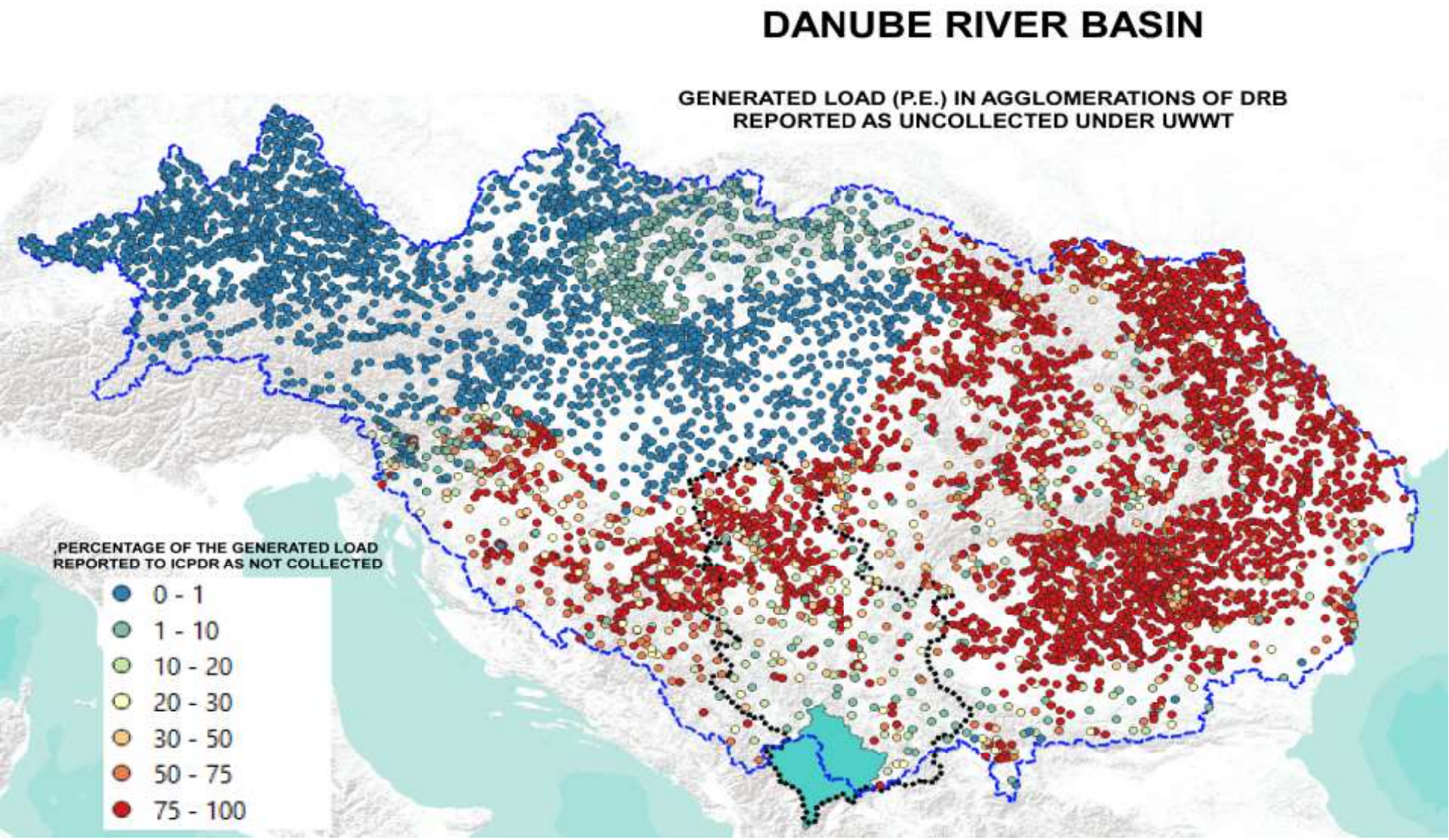


SOURCES: DATA FOR KOSOVO FROM MICS 2014; DATA FOR ROMANIA FROM HBS 2016; DATA FOR ALBANIA FROM NAWSSWI; WHO/UNICEF JMP DATABASE 2017.

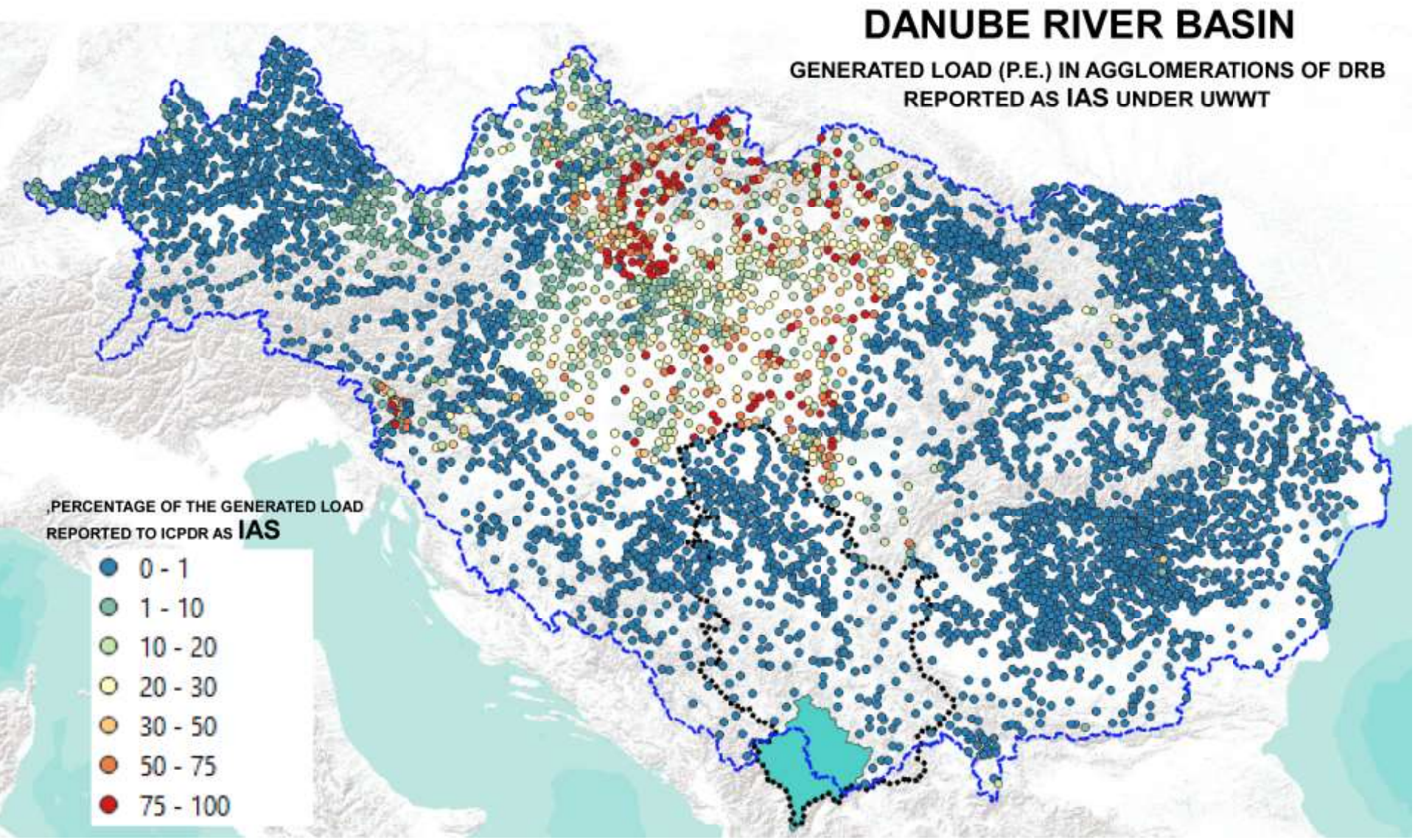
UWWT IN MORE DETAIL
Agglomeration size



Percentage not collected

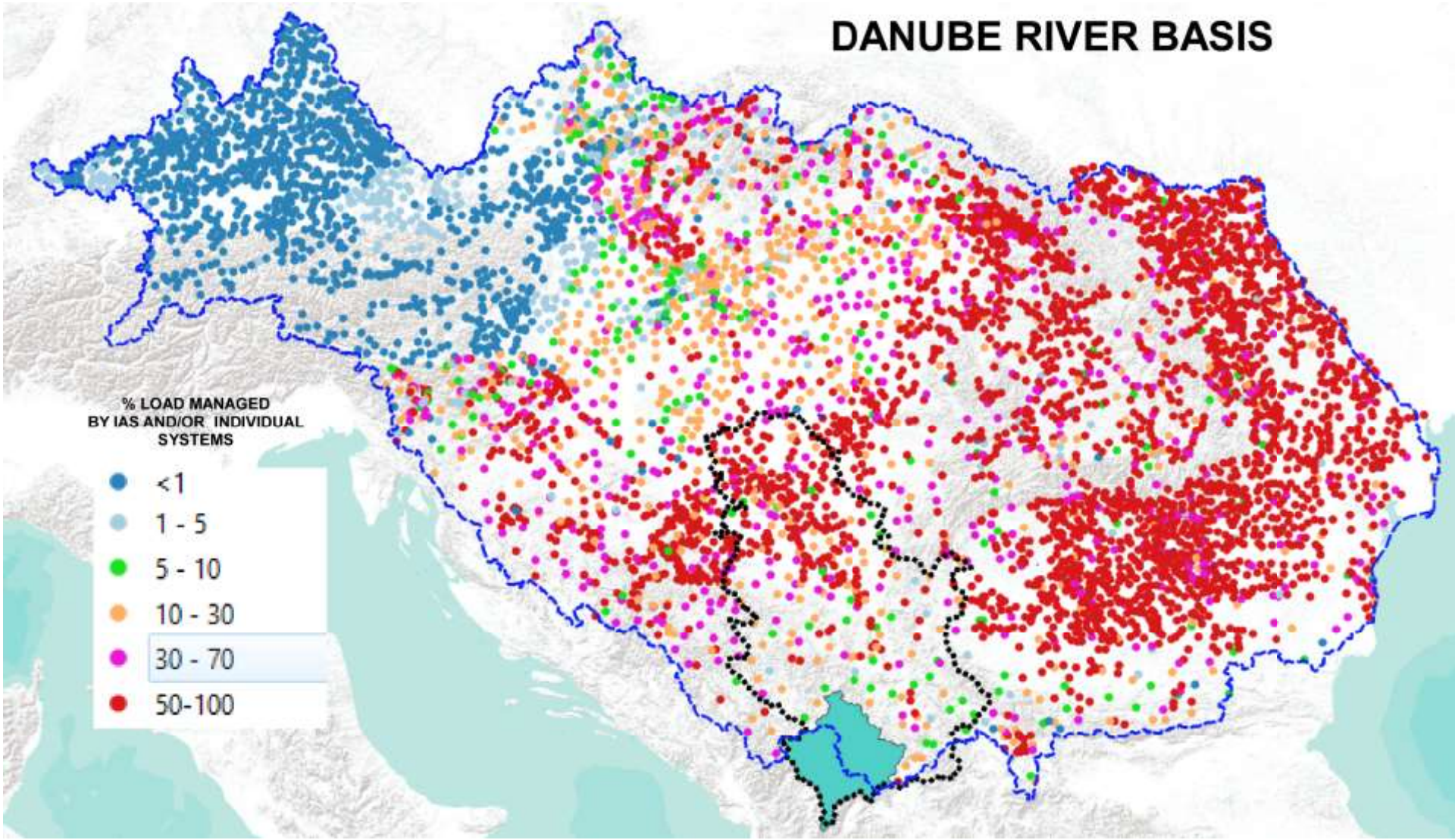


Percentage managed through IAS as defined by UWWT and presumably discharging via directly or indirectly to surface water bodies

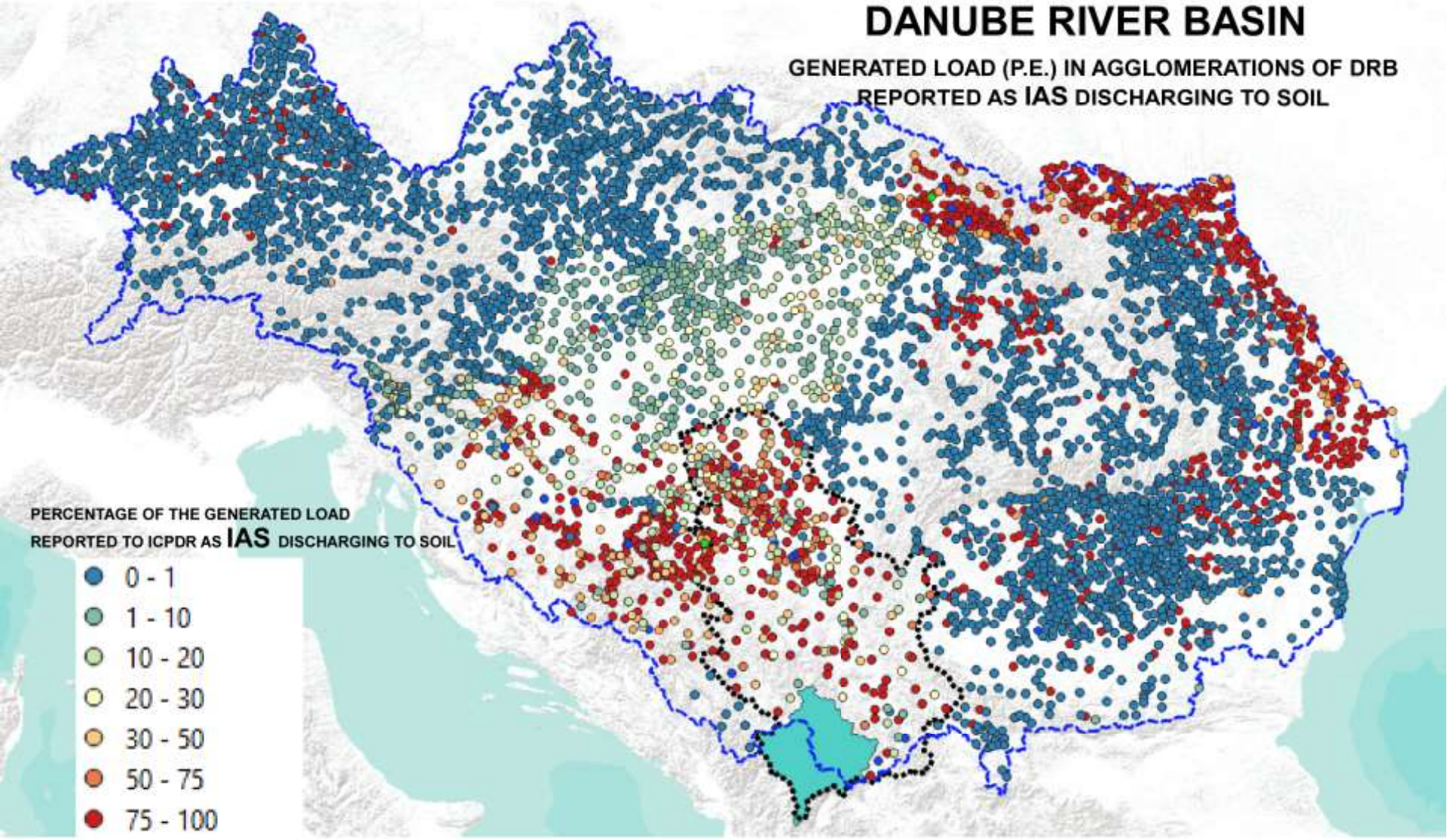


Percentage managed through IAS and/or „individual collection systems“ (septic tanks and pit lattrines, cess pools etc.)

IAS plus uncollected

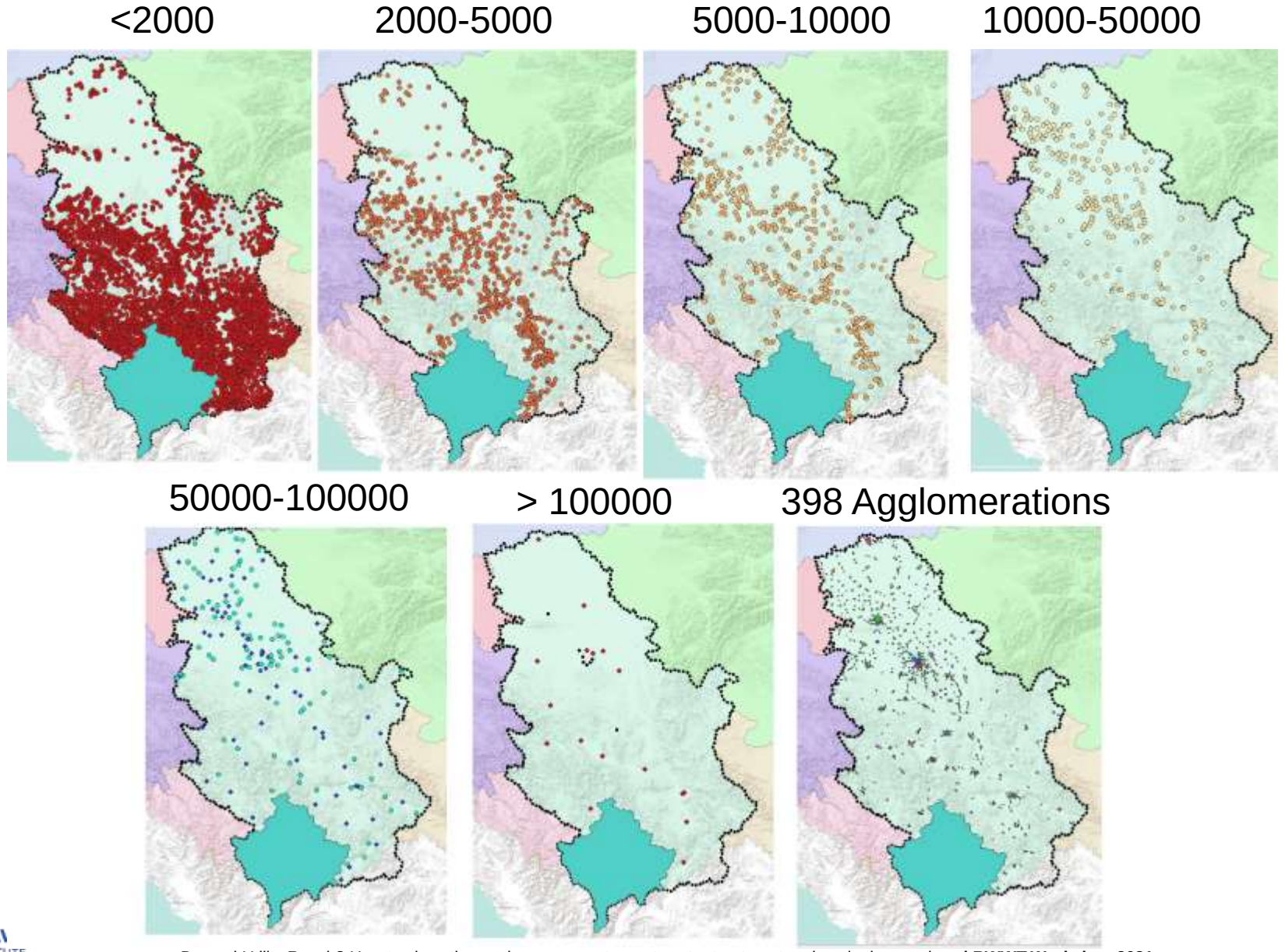


Percentage managed through IAS as defined by UWWT and discharging to soil and subsurface and not to surface water

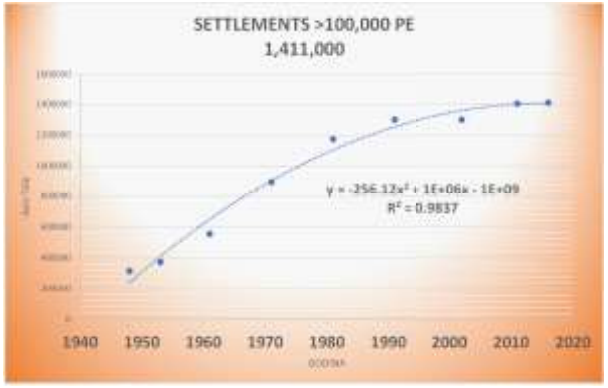


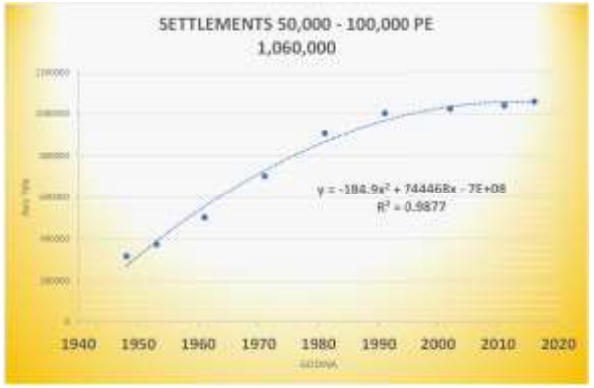
FOCUS ON SERBIA

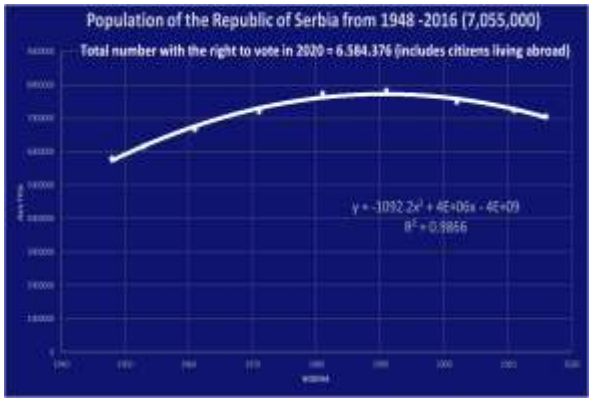
SETTLEMENTS AND AGGLOMERATIONS IN RS

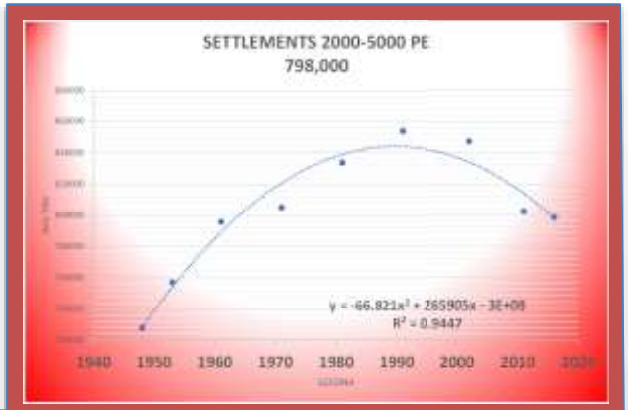


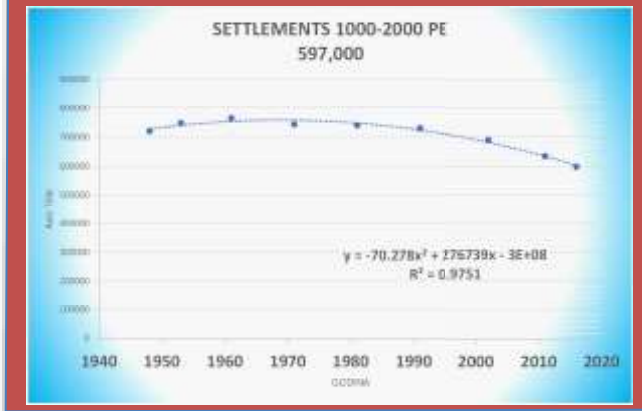
DEMOGRAPHICS OF RS

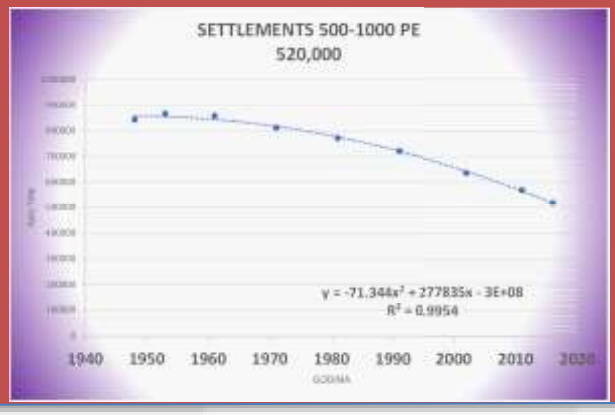


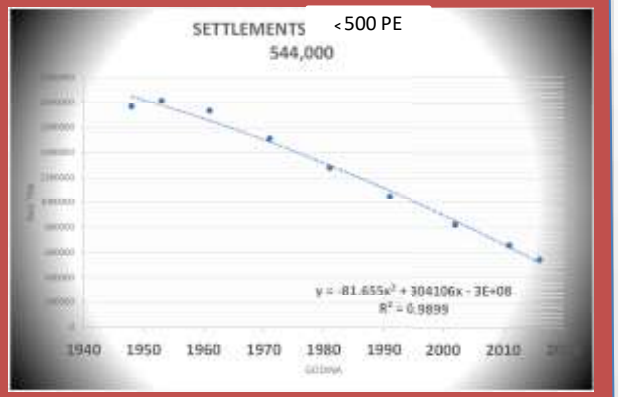






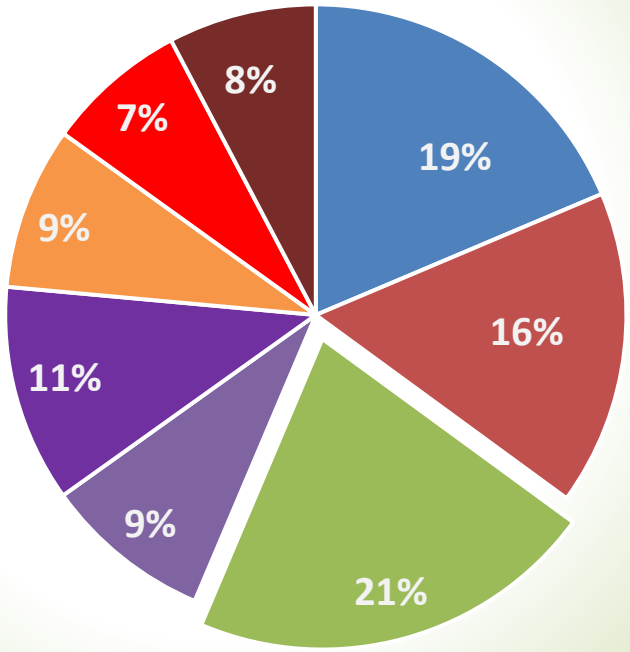




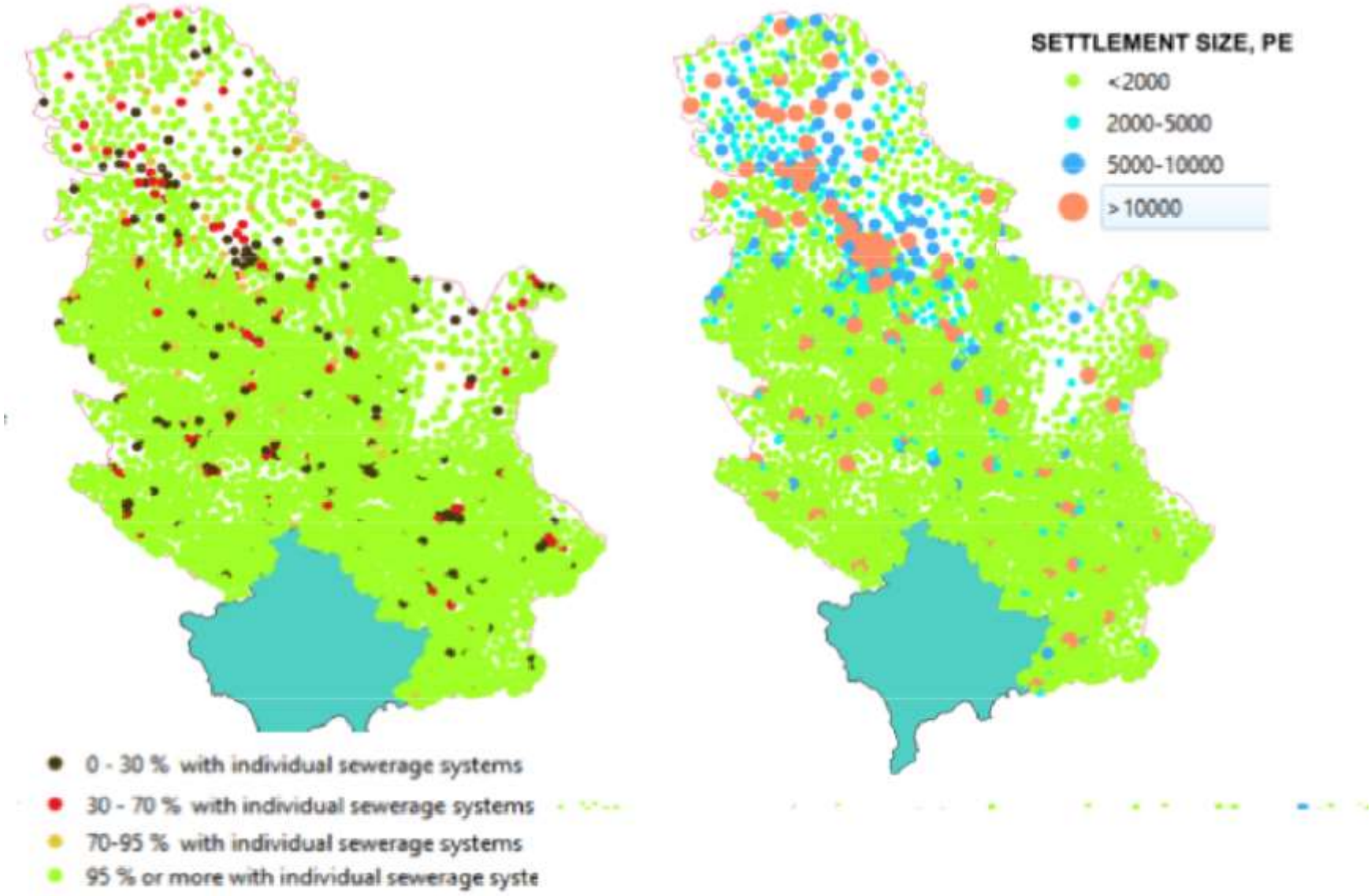


Distribution of total population into different settlement size classes in the Republic of Serbia

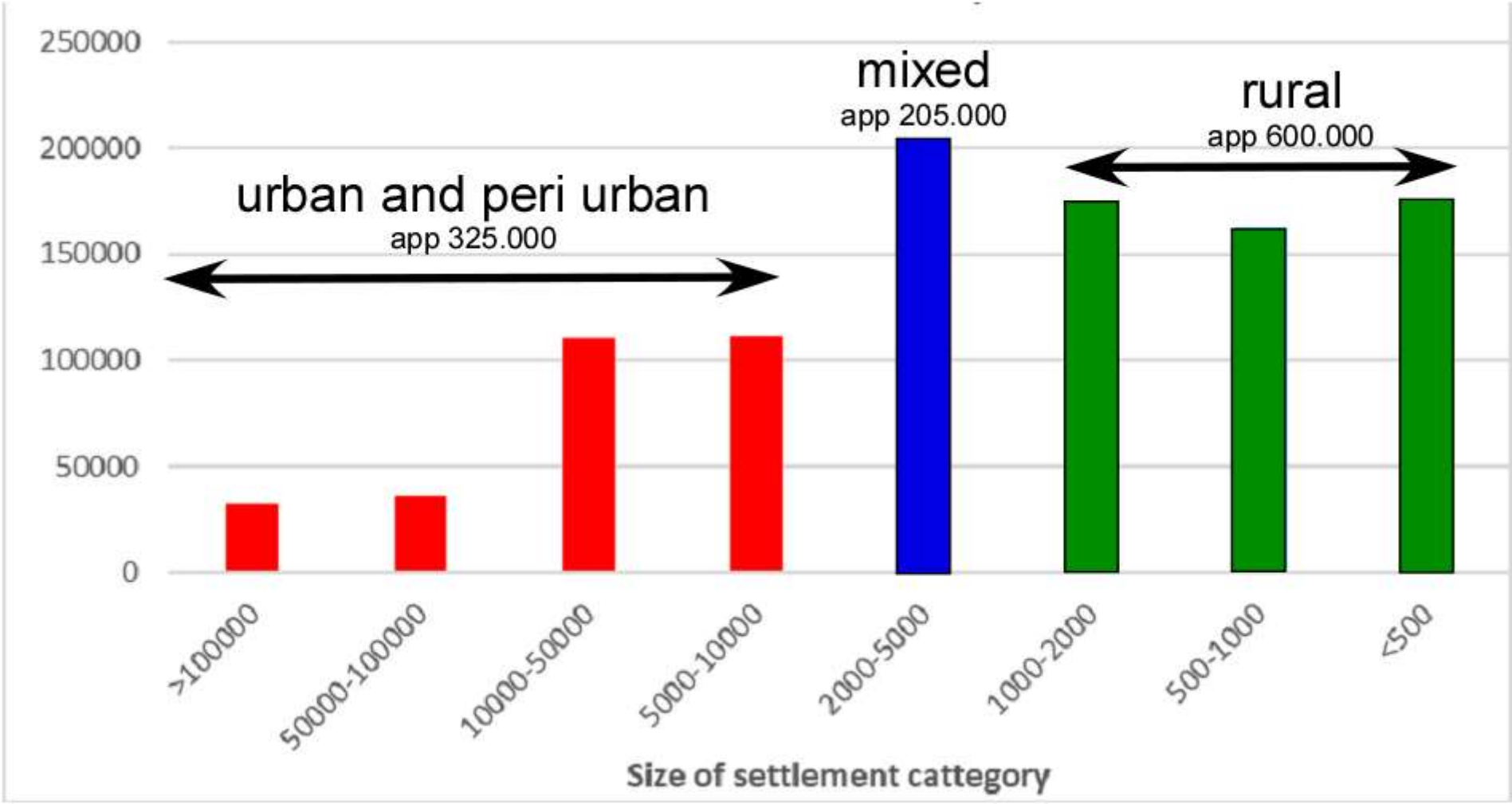
>100.000 = 19 %
>50.000 = 35 %
> 10.000 = 56 %
> 2.000 = 76 %
< 2.000 = 24 %



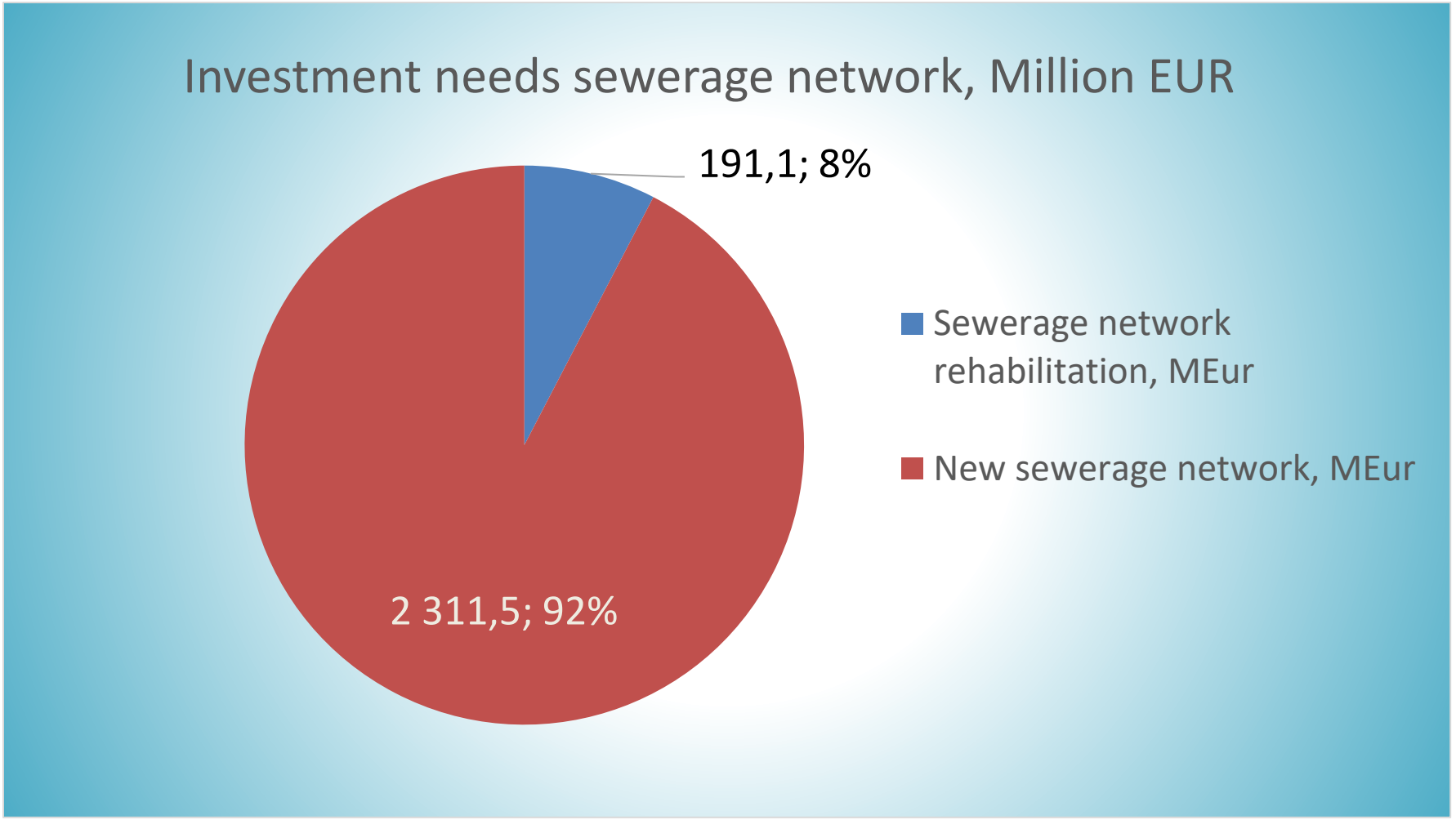
INDIVIDUAL SYSTEMS OF WASTE WATER COLLECTION AND SETTLEMENT SIZE IN RS



Estimated number of individual systems in 2016 in RS



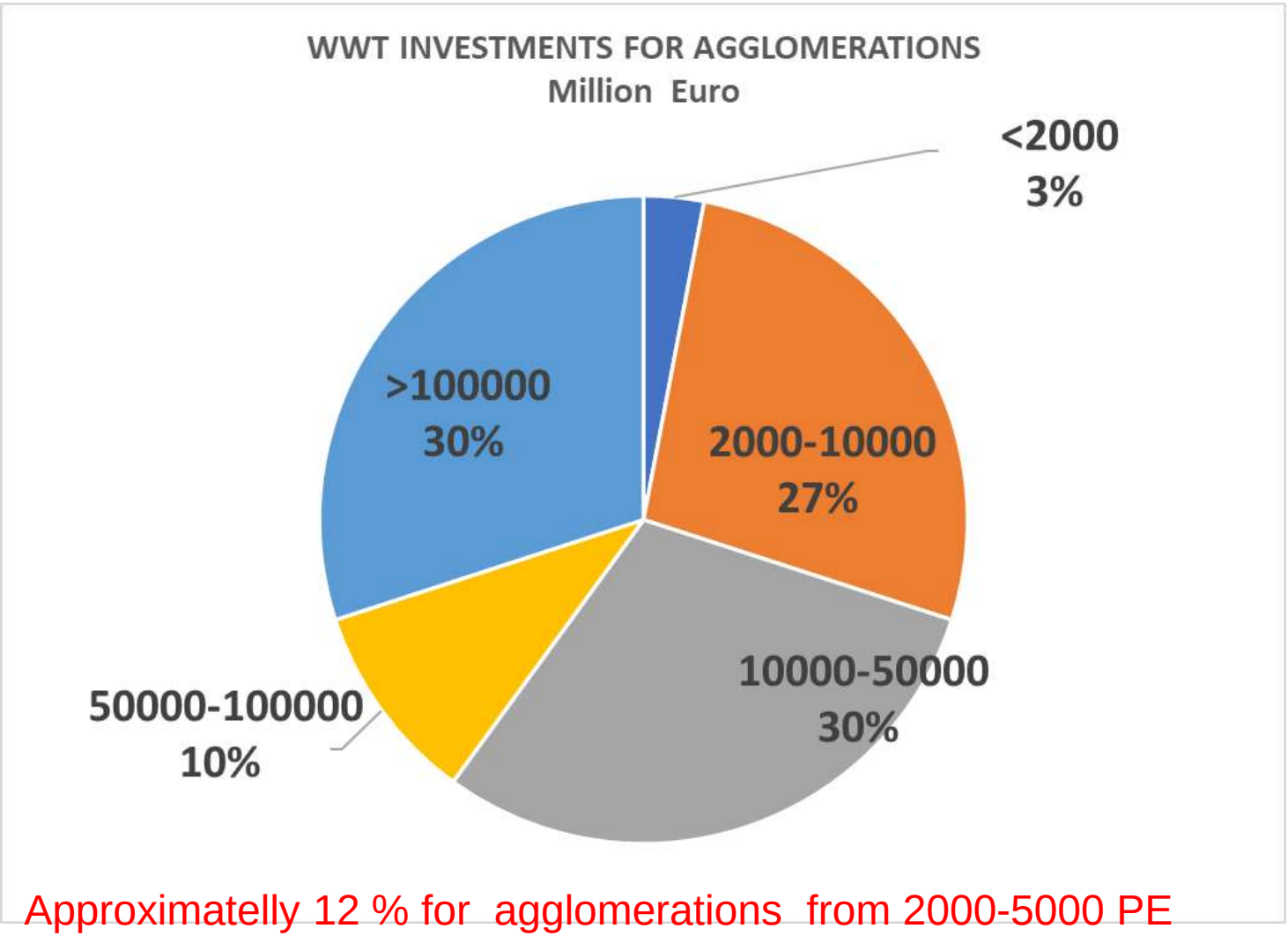
CURRENT PLANNING – COLLECTION SYSTEMS
(Data source: DSIP for UWWTP)



CURRENT PLANNING – WASTE WATER TREATMENT SYSTEMS

(Data source: Own computations based on DSIP for UWWT)

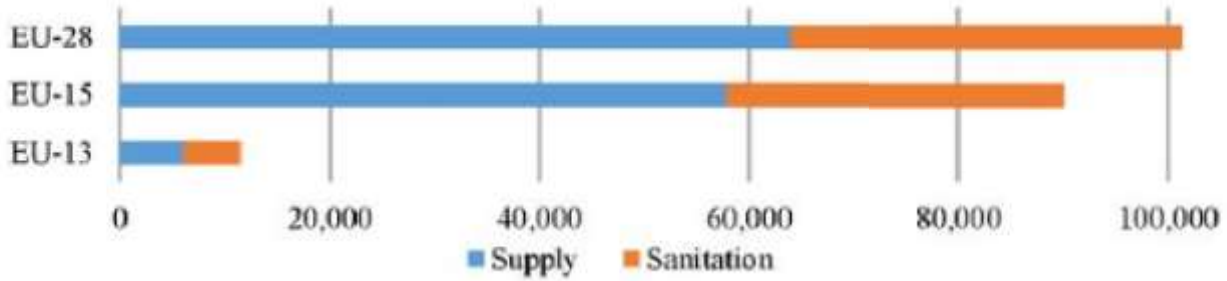
Total Investments app. 2,480,000,000 Euro



Approximatelly 12 % for agglomerations from 2000-5000 PE

Figure 2.2. Estimated annual expenditures for water supply and sanitation for the EU-28

(million EUR, 2011-15 annual average)

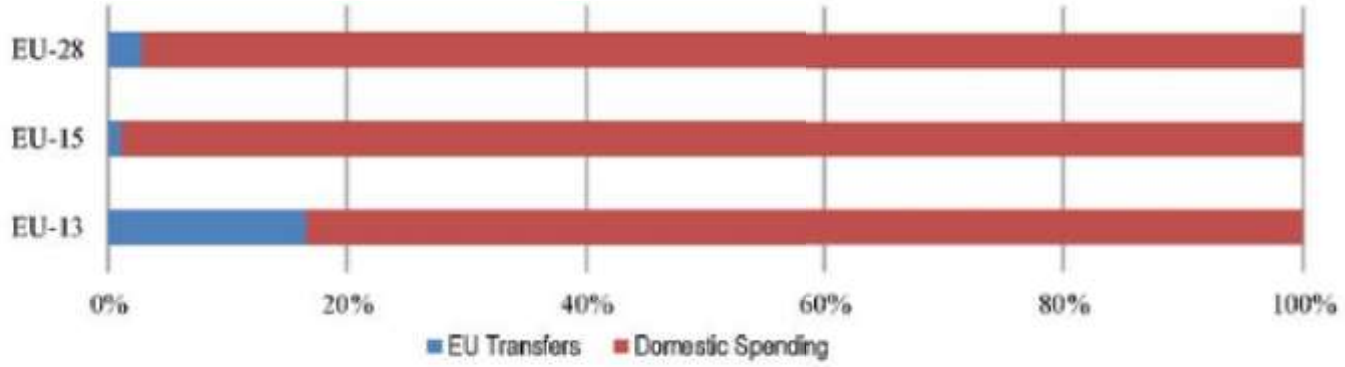


Note: Likely overestimate of supply-related expenditures (and corresponding underestimate of sanitation) in countries where wastewater-related charged are included in the water bill.

Source: EUROSTAT (General government expenditure by function, Final consumption expenditure on environmental protection services by institutional sector, Final consumption expenditure of households by consumption purpose, Mean consumption expenditure by detailed COICOP level).

Figure 2.9. Share of EU funding in estimated total expenditures for water supply and sanitation for the EU-28

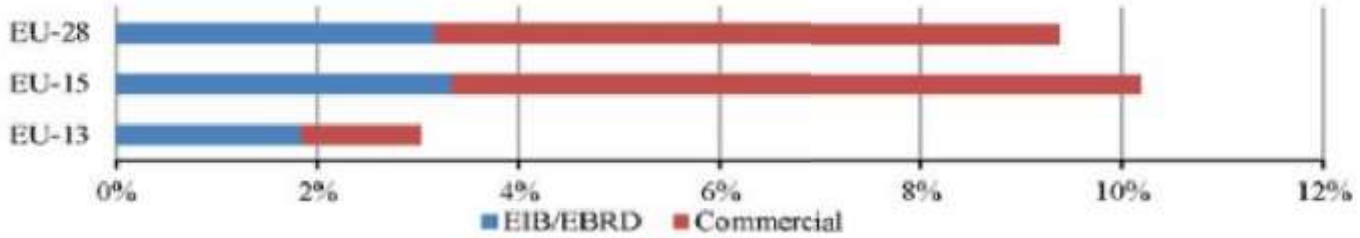
(%, 2011-2015 annual average)



Note: EU cohesion policy funds are channelled through domestic budgets of Member States.
Source: EUROSTAT (for past estimated expenditures), European Commission Directorate-General for Regional and Urban Policy (Open Data Portal for European Structural and Investment Funds).

Figure 2.11. Share of debt in estimated total expenditures for water supply and sanitation for the EU-28

(%, 2011-2015 annual average)



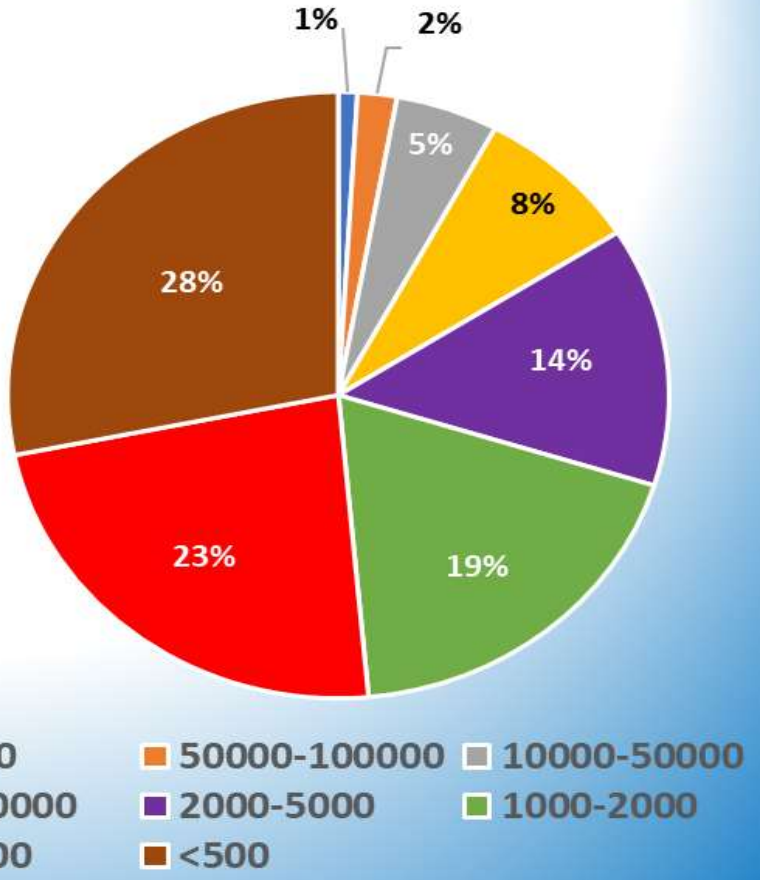
Note: Debt is assumed to be repaid by either (and therefore not additional to) government or household expenditures presented in previous figures

Source: EUROSTAT (for past estimated expenditures), European Investment Bank (loan database), European Bank for Reconstruction and Development (loan database), Commercial databases (IJ Global, Thomson Reuters, Dealogic).

JUST FOR THE ARGUMENT SAKE

Estimated number of the need for individual systems(IS) in settlements of different sizes

Settlement size	IS needed
>100.000	= 33.000
50.000-100.000	= 68.900
10.000-50.000	= 178.900
5.000-10000	= 289.900
2.000-5000	= 493.750
1.000-2.000	= 668.400



Assumption: No new centralized collecting systems are built

JUST FOR THE SAKE OF THE ARGUMENT # 2

Potential savings by going fully decentralized fo all settlements < 5000 PE

- **Avoid about 2 billion euros for sewer construction**
- **Avoid about 350 million euros for centralized wastewater treatment**

Additional costs for proper IAS individual systems for approximatelly 600.000 households

Savings directed to subsidies for each IAS of app. 4000 Euros

IS IT FEASABLE

BELGIUM

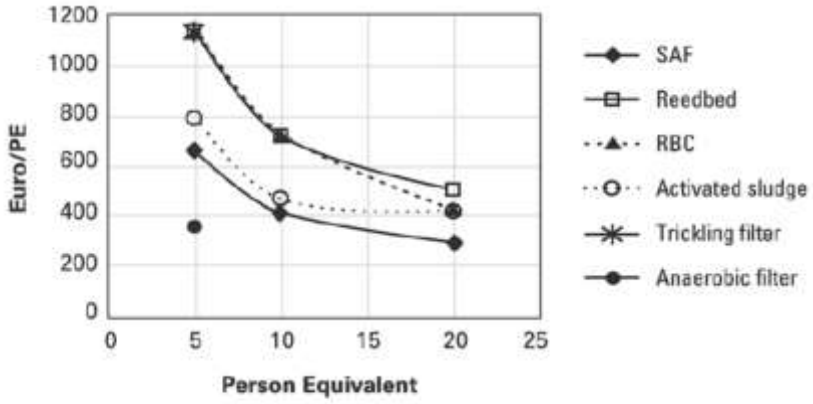


Figure 11-1: Capital Cost Per Person Equivalent for Individual and Small Cluster Wastewater Systems in Belgium. Note: SAF stands for submerged aerated filter; RBC stands for rotating biological contactor. *Source: Adapted from Geenens and Thoeye (2000), Figure 4. Used by permission of the copyright holder, the International Water Association.*

USA

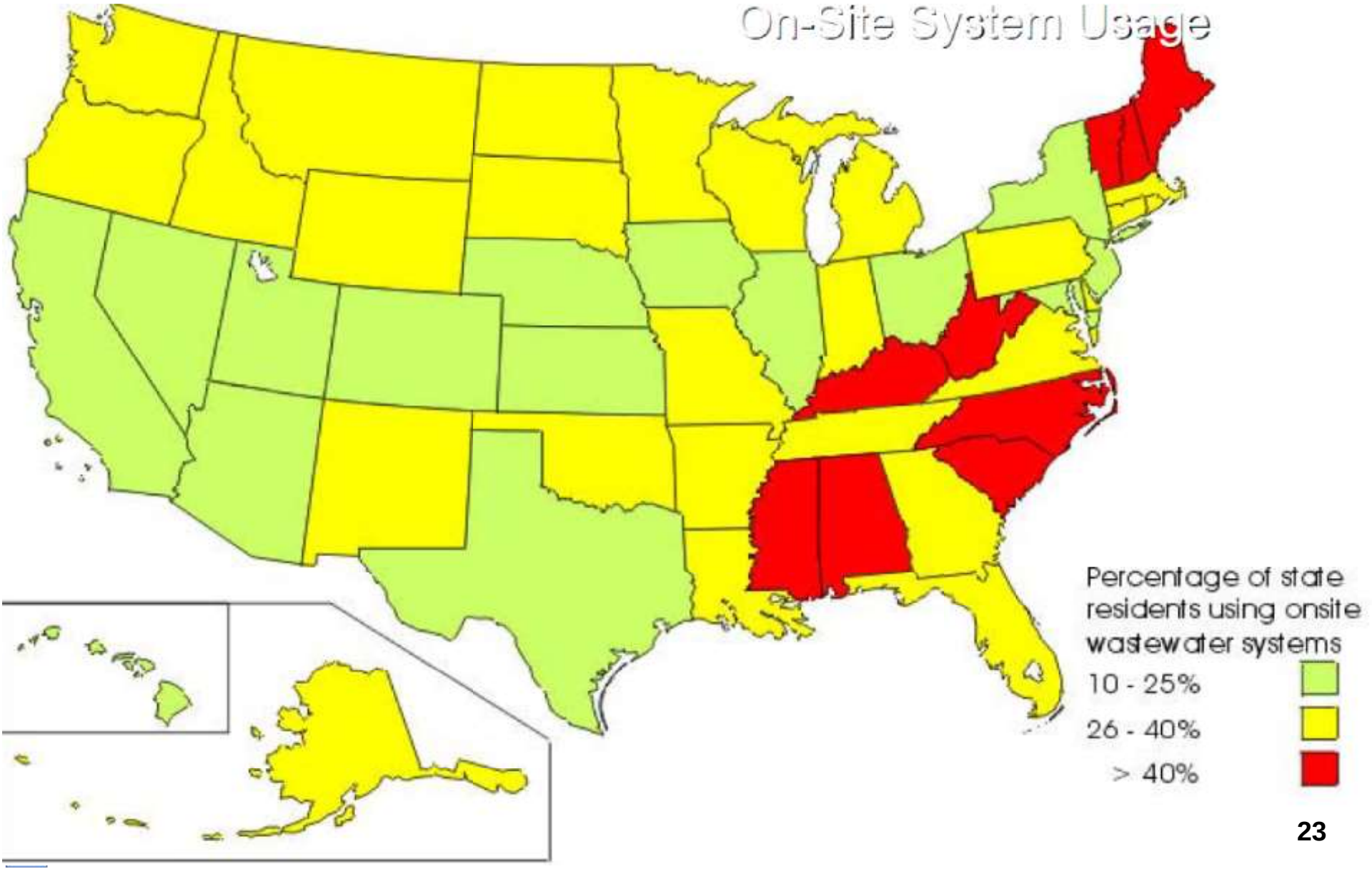
Average costs of decentralized treatment systems

Treatment Method	Technology	Capital Cost
Conventional	Septic Tank and Gravity Soil System	$5,000 to $6,000
Suspended Growth	Suspended Growth Aerobic Treatment	$6,000 to $8,000
	Attached Growth Aerobic Treatment	$9,000 to $13,000
Attached Growth	Intermittent Media Filter	$6,500 to 11,500
	Recirculating Media Filter	$8,000 to $11,500
	Vegetative Submerged Bed	$7,500 to $10,500
Pressure Dispersal	Pressure Distribution	$7,000
	Drip Dispersal	$7,800 to $9,300
Cluster Systems	Conventional sewer	$14,000**
	STEG	$7,500**
	STEP	$10,000**
	Vacuum	$10,000**
	Grinder Pump	$9,500**

*NOTE: Costs vary with labor, materials, other factors; **cost per EDU in clusters > 100 EDUs*

JAROSLAV ČERNI WATER INSTITUTE
Beyond Utility Reach? How to close the rural access gap to wastewater treatment and sanitation services **| RWWT Workshop 2021**

The example of USA



Detailed analysis needed on all costs and benefits

Many additional advantages possible and realistic

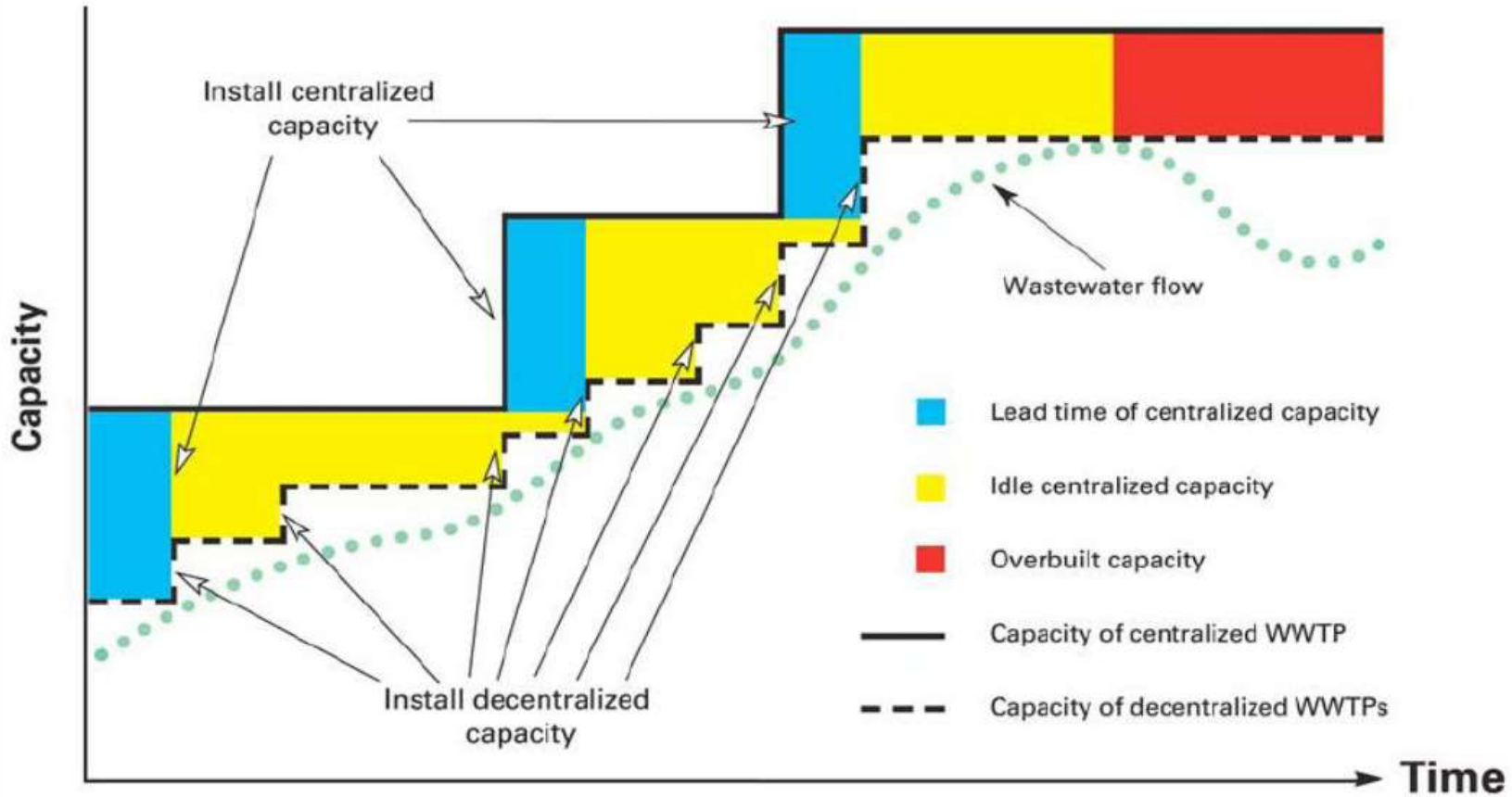
- Flexibility
- Mobilization of additional funding for facilities from households (use available budget for subsidy and not full investment)
- Job Creation

Main problem is not technology but management

Different management models to consider

Identification of all role players and their responsibilities etc.

Economics and free capacity



Flow Versus Capacity for Centralized and Decentralized Wastewater Systems. WWTP stands for Wastewater Treatment Plant.

Source: RMI 2004

Some possible management models

MANAGEMENT MODEL	
1: RESPONSIBLE HOMEOWNER 	To ensure that conventional onsite systems are sited and constructed properly in accordance with appropriate state and local regulations and codes; that they are periodically inspected; and, if necessary, that they are repaired by the Owner. The Regulatory Authority maintains a record of the location of all systems and periodically provides the Owner/User with notices regarding operation and preventive maintenance recommendations.
2: MAINTENANCE CONTRACTS 	To allow use of more complex mechanical treatment options or small clusters through the requirement that maintenance contracts be maintained between the Owner and maintenance provider to ensure appropriate and timely system component maintenance by qualified technicians over the service life of the system.
3: OPERATING PERMITS 	To issue renewable/revocable operating permits to system Owner that stipulate specific and measurable performance criteria for the treatment system and periodic submittals of compliance monitoring reports. The performance criteria are based on risks to public health and water resources posed by wastewater dispersal in the receiving environment. Operating permits allow the use of clustered or onsite systems on sites with a greater range of site characteristics.
4: RME OPERATION AND MAINTENANCE 	To ensure that onsite/decentralized systems consistently meet their stipulated performance criteria through Responsible Management Entities that are responsible for operation and performance of systems within their service areas.
5: RME OWNERSHIP 	To provide professional management of the planning, siting, design, construction, operation, and maintenance of onsite/decentralized systems through Responsible Management Entities that own and manage individual and clustered systems within their service areas.

- **1 = RESPONSIBLE HOMEOWNER, 2 = MAINTANANCE CONTRACT, 3 = OPERATING PERMIT, 4 = O&M OUTSOURCING, 5 = RESPONSIBLE MANAGEMENT AGENT**

ROLE PLAYERS AND MANAGEMENT MODELS

IMPLEMENTATION PHASE	Regulatory Authority	Service Provider	Owner	User	Developer	Licensing Board/	Site Evaluator	Designer	Contractor/ Installer	Designer of Record	Pumper Hauler	Operator	Inspector	RMA
PUBLIC EDUCATION & PARTICIPATION	12345	1234	1234	12345										45
PLANNING	12345				12345									45
PERFORMANCE	12345		1234	1235										45
TRAINING AND CERTIFICATION LICENSING	12345	12345	1234	123		12345								45
SITE EVALUATION	12345		1234				12345							5
TECHNICAL DESIGN	12345		1234					12345						5
CONSTRUCTION	1 2345		1234						12345	12345				5
OPERATION AND MAINTANANCE	12345		1234	12345							12345	2345		45
RESIDUALS MANAGEMENT	12345										12345			45
COMPLIANCE MONITORING	12345		1234								123	3	45	45
CORRECTIVE ACTION	12345		123					12345	12345				345	45
RECORD KEEPING AND REPORTING	12345		1234								1234	235	35	45
FINANCIAL ASSISTANCE & FUNNDING	12345													45

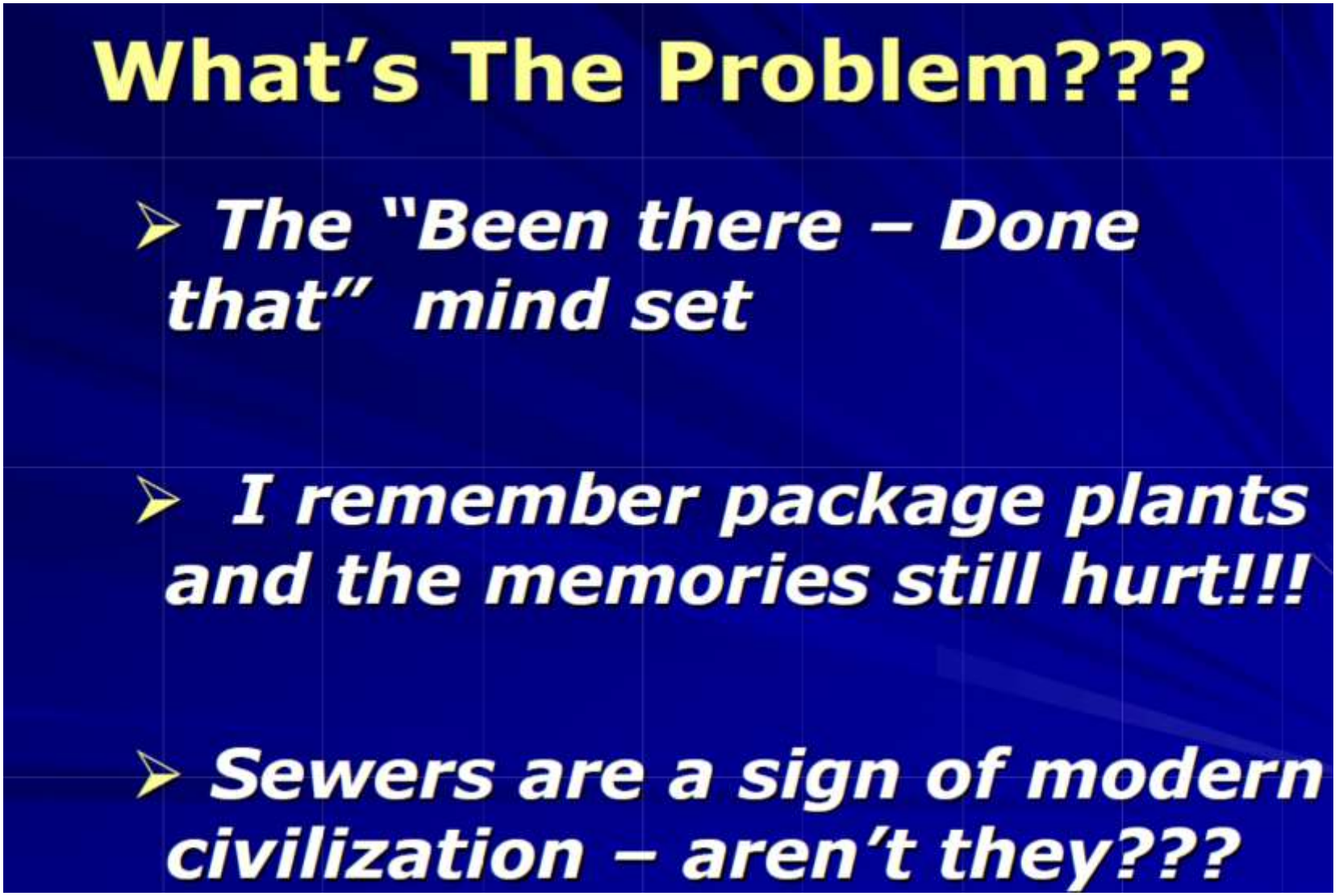
PREREQUISITE

ENABLING LEGAL FRAMEWORK FROM EU AND NATIONAL GOVERNMENTS WHICH IS CURRENTLEY NOT THE CASE

IS THERE ANYTHING THAT THE UWWT DIRECTIVE DOES NOT CONSIDER OR RECOGNISE

1. **RECOGNISING SOIL AS A RECIPIENT OF TREATED OR UNTREATED WASTEWATER**
2. **INDIVIDUAL SYSTEMS NOT DISCHARGING TO AN EXISTING TREATMENT PLANT (BY TRUCK OR OTHERWISE) SINCE TREATMENT IS ALLREADY PROVIDED**
3. **RURAL AGGLOMERATIONS(SETTLEMENTS) < 5000 P.E.**

FORGET THE PAST – WE CAN DO BETTER NOW



SUGGESTIONS

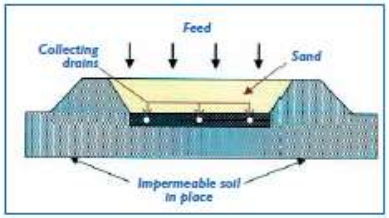
DRB STUDY TO CONSIDER AND DEVELOP APPROPRIATE MANAGEMENT MODELS AND IDENTIFY ROLEPLAYERS AND THEIR RESPONSIBILITY FOR EFFECTIVE IMPLEMENTATION

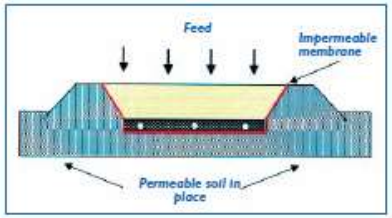
LOBBYING THE EU TO CREATE AN ENABLING LEGAL FRAMEWORK FOR DECENTRALIZATION AND THE BIGGER ROLE OF IAS

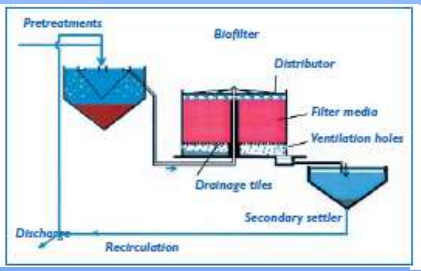
THANK YOU!

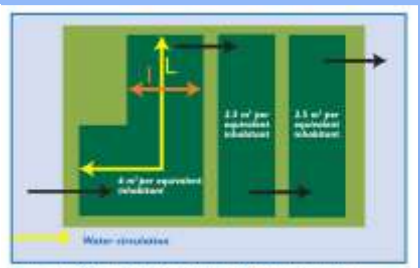
ADDITIONAL SLIDES FOR EVENTUAL RESPONSE TO QUESTIONS

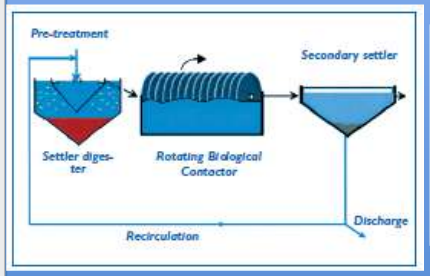
Recognized as an option

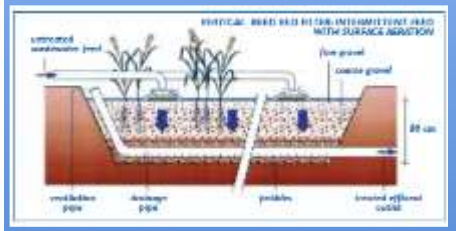


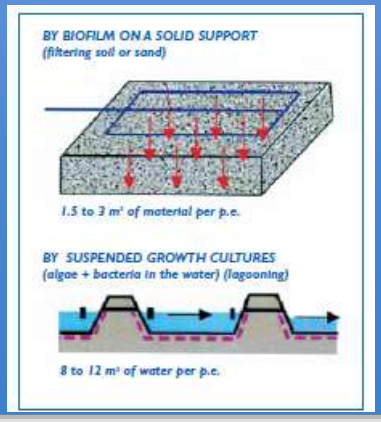


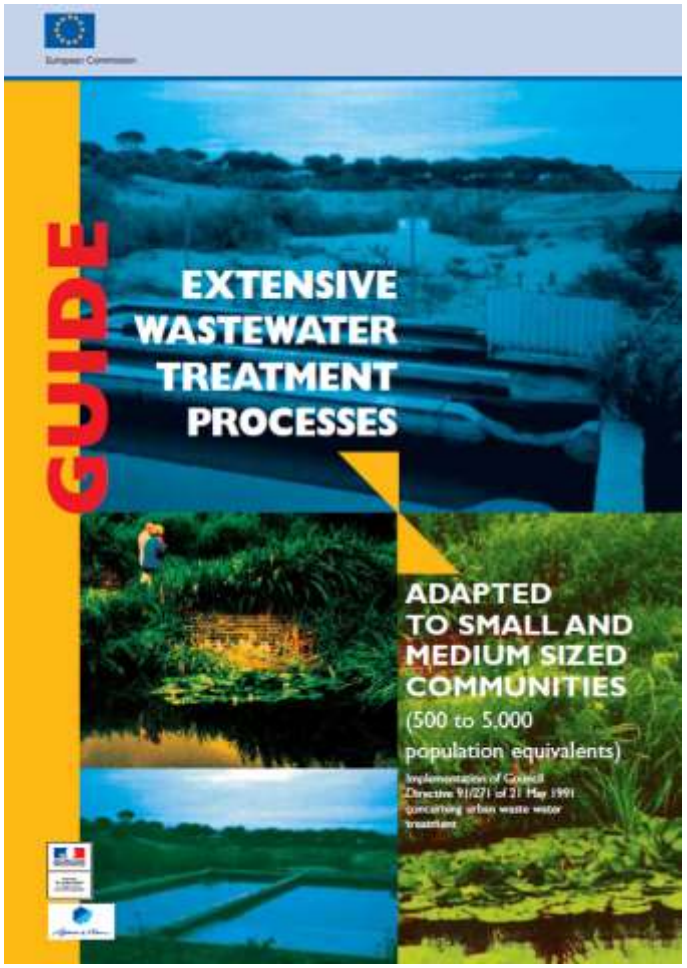










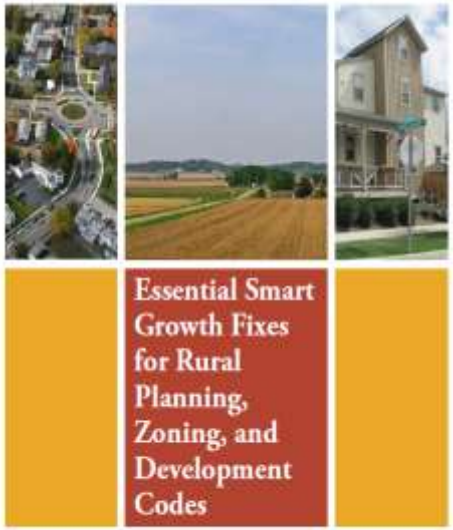


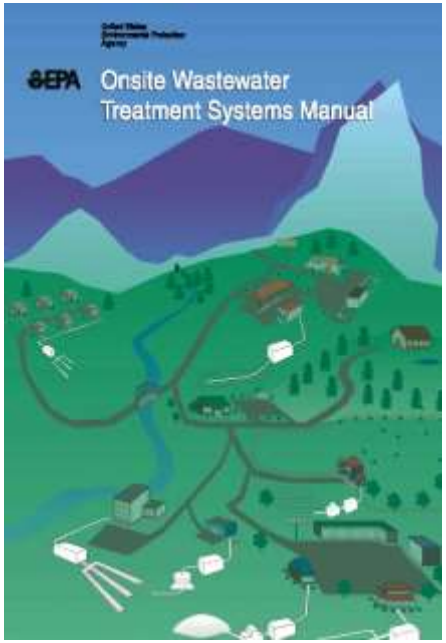
2001

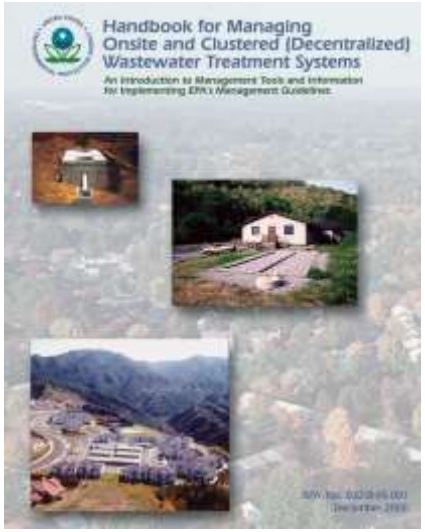
on-site (stand-alone) treatment (septic tanks with subsoil or sand filters, cesspool, etc.) not covered

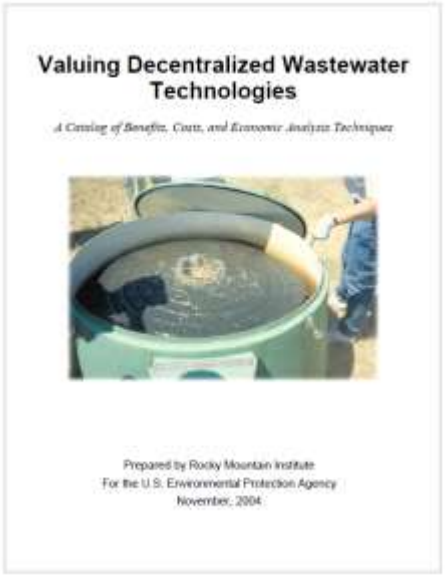

"Wastewater Management in the Danube Region: Challenges and opportunities of EU Accession"
Learning from the Experience of Implementation of the EU's Urban Waste Water Treatment Directive in EU Member Countries
Final Study Report
30 September 2017
umweltbundesamt


Evaluation of the
Urban Waste Water Treatment Directive


Essential Smart Growth Fixes for Rural Planning, Zoning, and Development Codes
EPA


EPA
Onsite Wastewater Treatment Systems Manual


Handbook for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems
An Introduction to Management Tools and Information for Implementing EPA's Management Guidelines

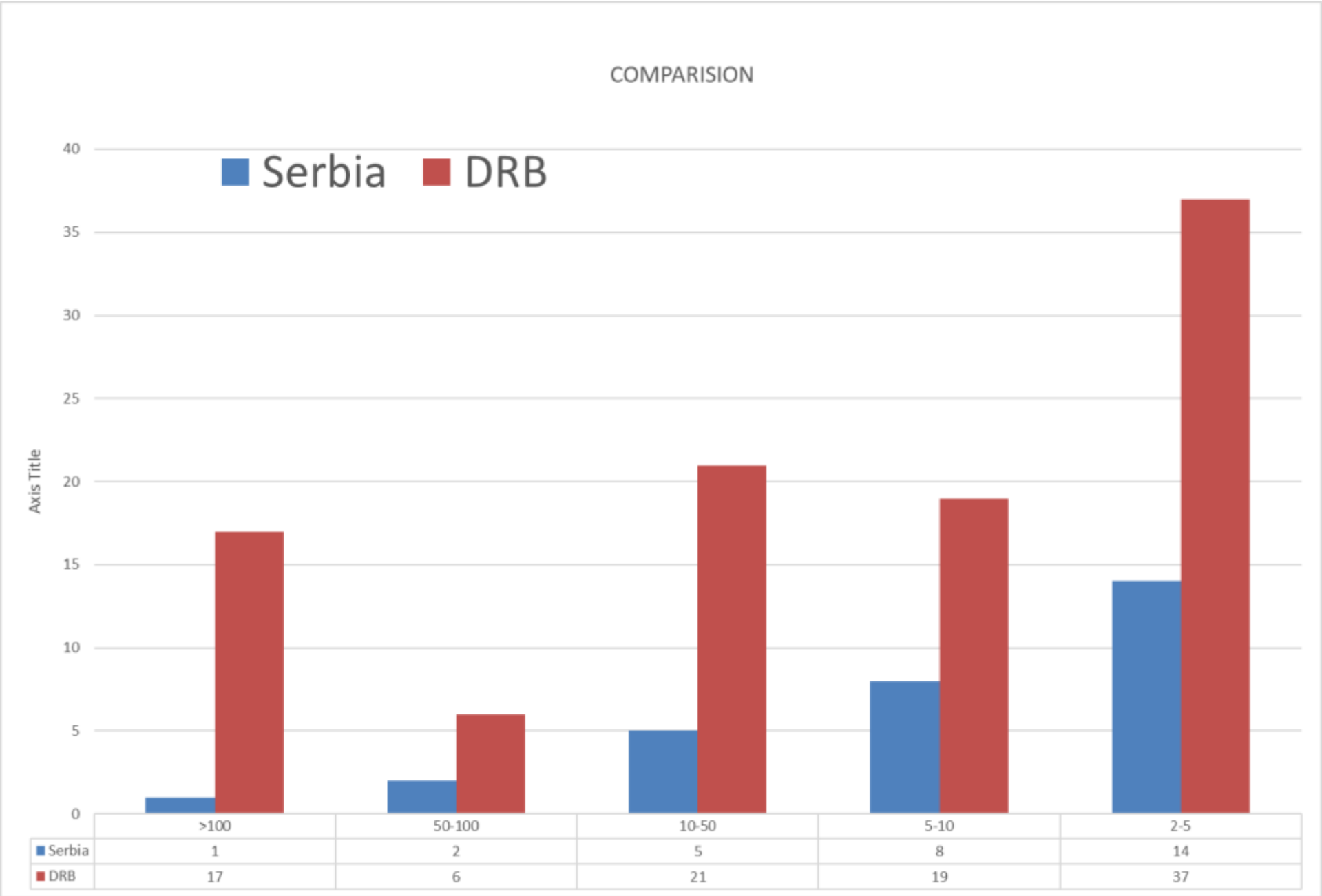

Valuing Decentralized Wastewater Technologies
A Catalog of Benefits, Costs, and Economic Analysis Techniques
Prepared by Rocky Mountain Institute
For the U.S. Environmental Protection Agency
November, 2004


EPA


Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems
Management Guidelines

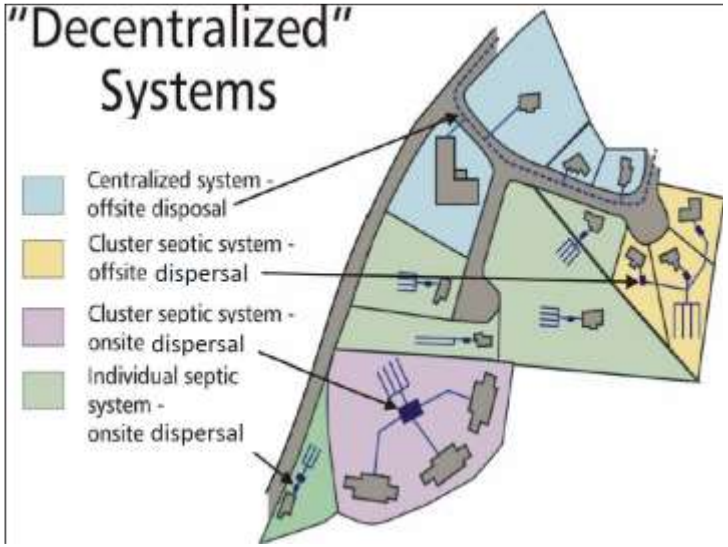
US EPA resources at www.epa.gov/owm/septic

- Design guidance
- Management guidelines
- Case studies
- Technology fact sheets
- State and local examples
- Research, demonstration projects, and other tools

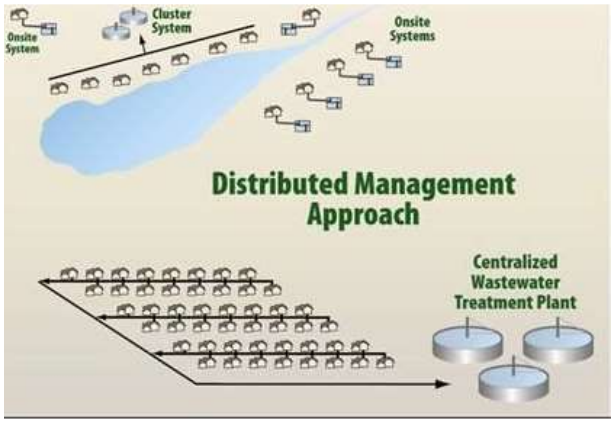


	>100	50-100	10-50	5-10	2-5
Serbia	1	2	5	8	14
DRB	17	6	21	19	37


STOP SEWER PLANT
IN OUR NEIGHBORHOOD


"Decentralized" Systems
Centralized system - offsite disposal
Cluster septic system - offsite dispersal
Cluster septic system - onsite dispersal
Individual septic system - onsite dispersal


Traditional Centralized Sewer Extension
Wastewater Treatment Plant


Onsite System
Cluster System
Onsite Systems
Distributed Management Approach
Centralized Wastewater Treatment Plant

LOWLANDS OF NORTHERN SERBIA (2000-5000 P.E.)

HIGHLANDS OF NORTHERN SERBIA (2000-5000 P.E.)

LOWLANDS OF SOUTHERN SERBIA (2000-5000 P.E.)

HIGLANDS OF SOUTHERN SERBIA (2000-5000 P.E.)

LOWLANDS (500 - 1000 P.E.)

HIGHLANDS (500 - 1000 P.E.)

GERMANY

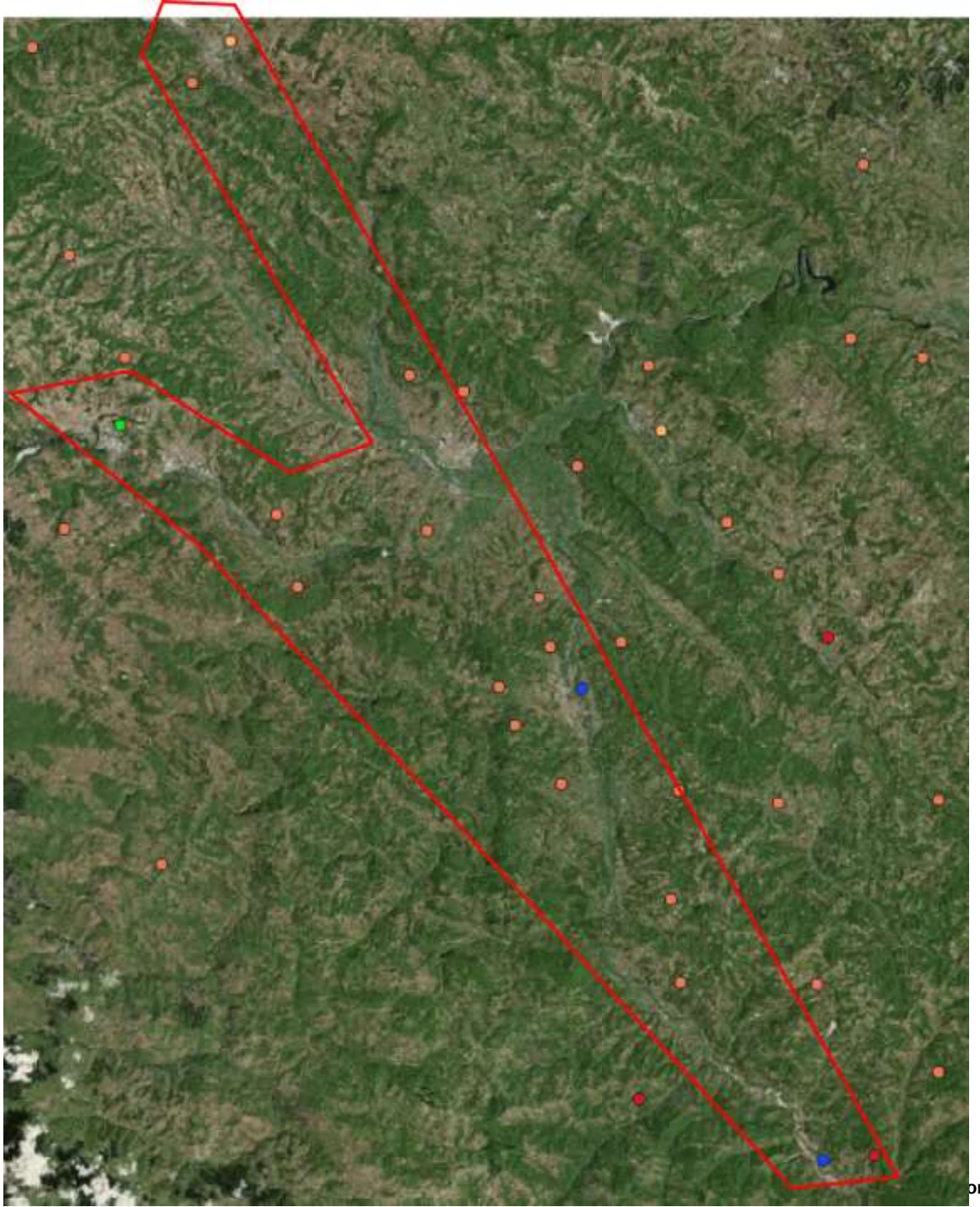
AUSTRIA

CZECH

SERBIA

BULGARIA

ROMANIA



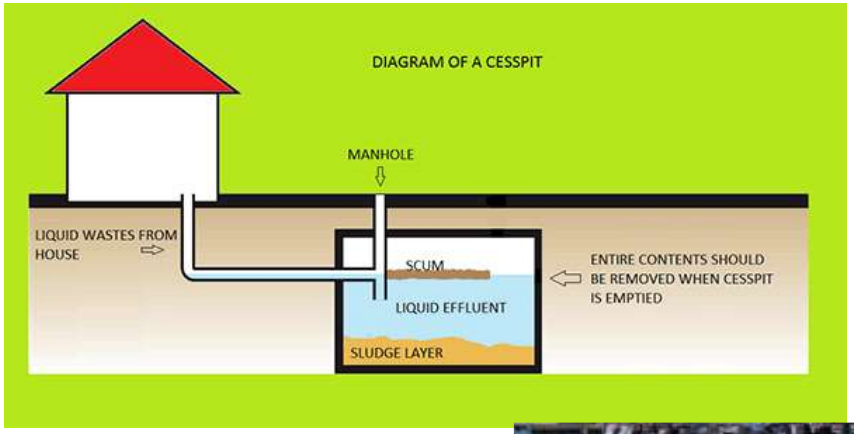
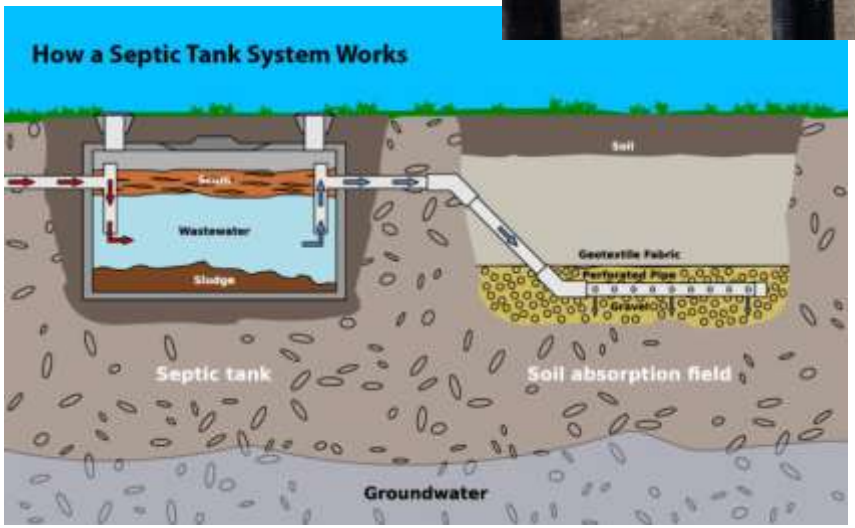
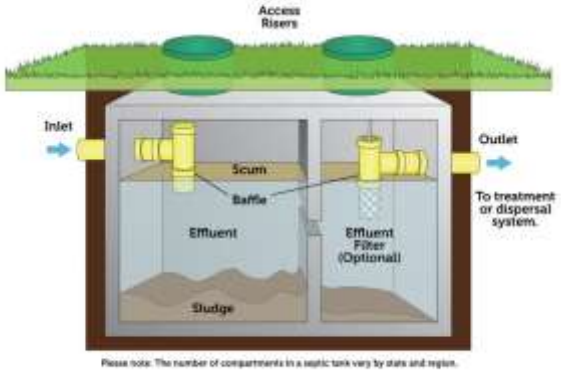


DIAGRAM OF A CESSPIT
MANHOLE
LIQUID WASTES FROM HOUSE
SCUM
LIQUID EFFLUENT
SLUDGE LAYER
ENTIRE CONTENTS SHOULD BE REMOVED WHEN CESSPIT IS EMPTIED

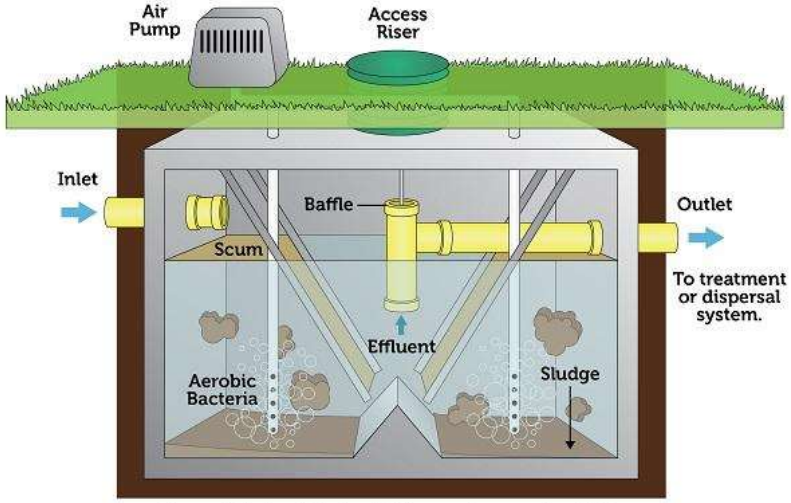

How a Septic Tank System Works
Soil
Scum
Wastewater
Sludge
Geotextile Fabric
Perforated Pipe
Gravel
Septic tank
Soil absorption field
Groundwater

Septic Tank



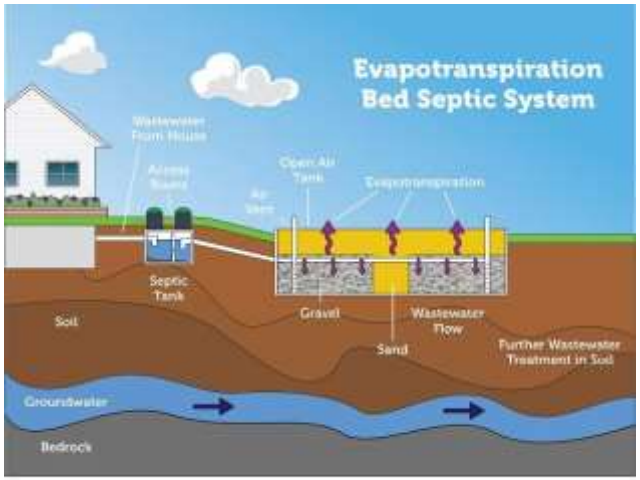
Please note: The number of compartments in a septic tank vary by state and region.

Aerobic Treatment Unit

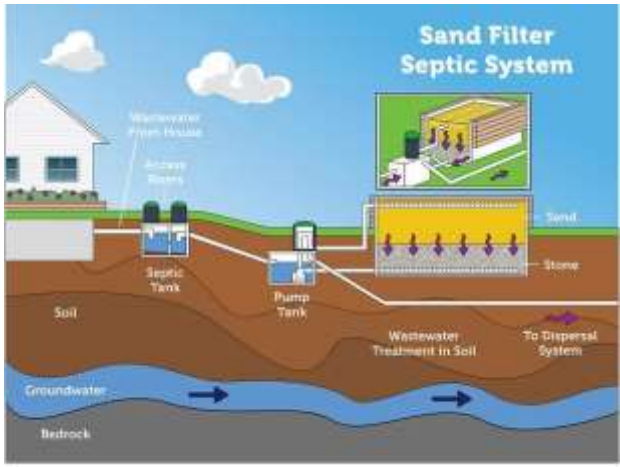


Please note: The Aerobic Treatment Unit can vary in components and design

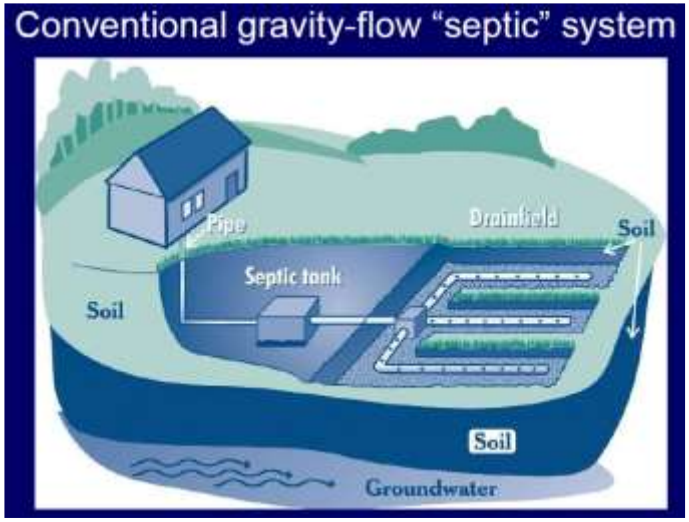
Please note: Septic systems vary. Diagram is not to scale.

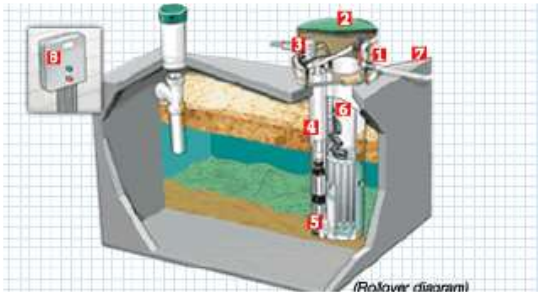


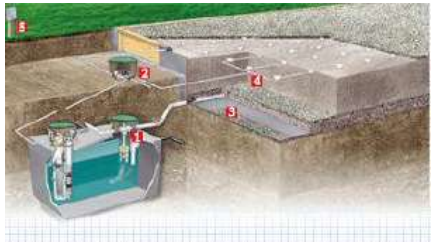
Please note: Septic systems vary. Diagram is not to scale.



Please note: Septic systems vary. Diagram is not to scale.


Conventional gravity-flow “septic” system
Pipe
Drainfield
Soil
Septic tank
Soil
Soil
Groundwater





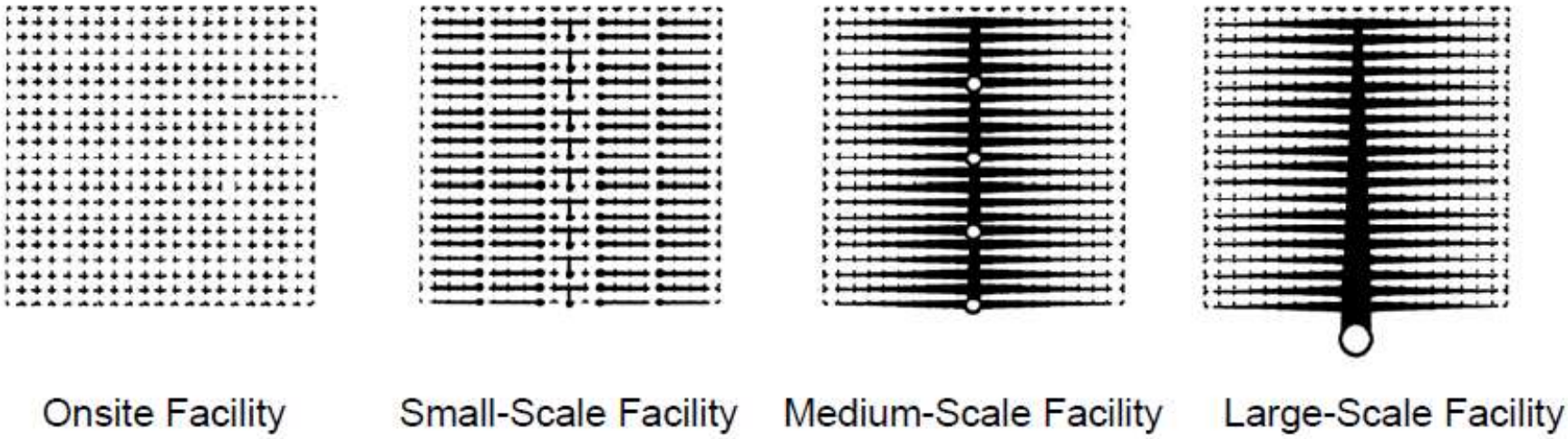


Figure 11-5: Conceptual Illustration of Increasing Pipe Length and Size as the Population Served Increases. *Source: Clark (1997), Figure 1.1. Courtesy of Richard Clark.*

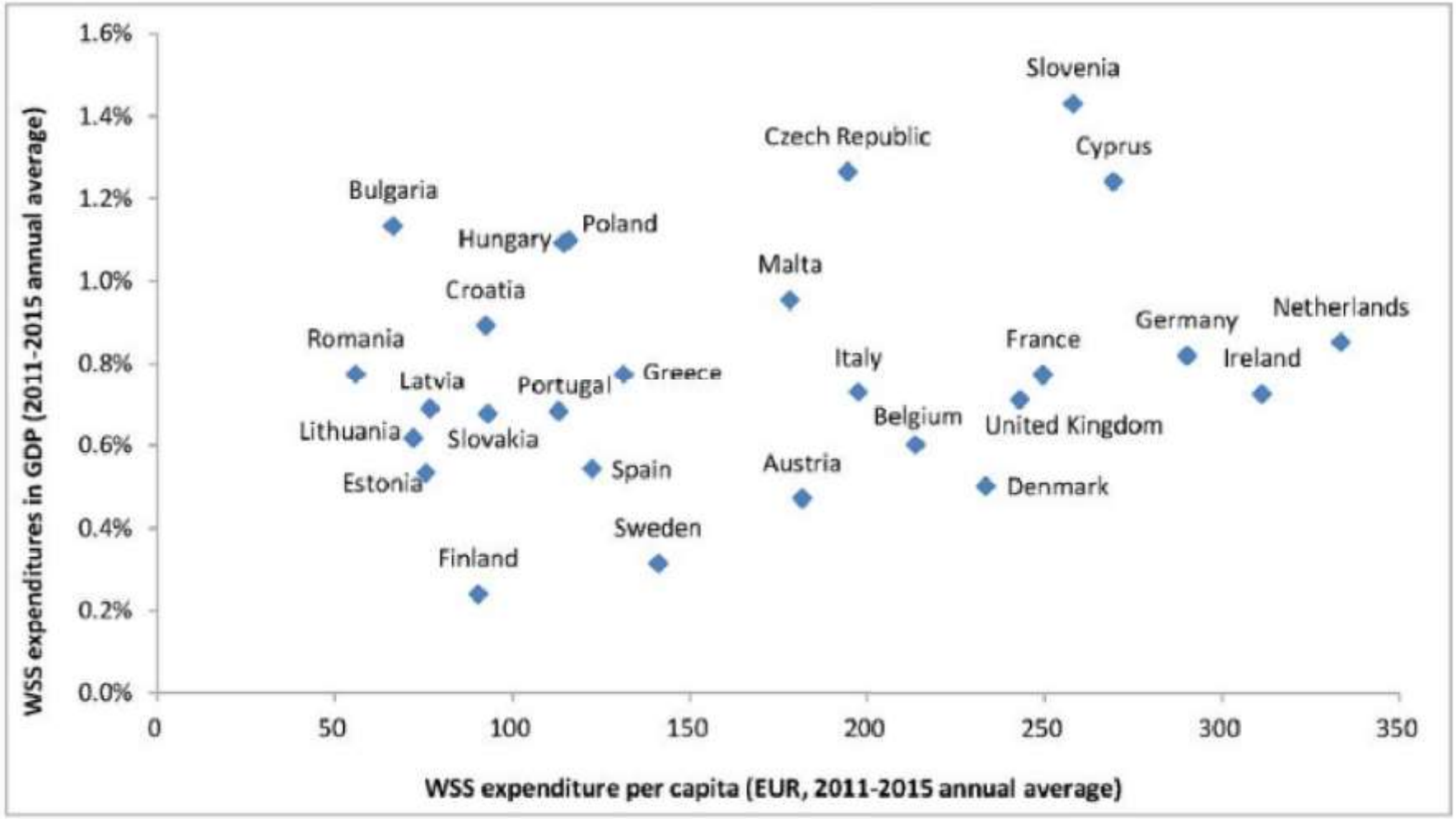
Table 13-1. Summary of Management Program Elements and Possible Activities

Program Element	Purpose	Basic Activities	Advanced Activities
Public education and participation	To maximize public involvement in the need for and implementation of the management program.	Provide public meetings, forums, updates, and education programs.	Provide public advisory groups, review groups, and other involvement opportunities in addition to basic program.
Planning	Consider regional and site conditions and impacts, long-term watershed, and public health protection.	Establish minimum lot sizes, surface/ground water setbacks and/or identify critical areas requiring more protection.	Monitor and model regional pollutant loads of different development scenarios; tailor development patterns and requirements to receiver site environmental conditions and technological capabilities.
Performance requirements	Link treatment standards and relative risk to health and water resource goals.	Prescribe acceptable site characteristics and/or system types allowed.	Require system performance to meet standards that consider water resource values, vulnerabilities, and risks.
Site evaluation	Assess site and relationship to other features.	Characterize landscape position, soils, ground & surface water location, size, and other site conditions.	Assess site and cumulative watershed impacts, ground water mounding potential, long-term specific pollutant trends, and cluster system potential.
Design	Ensure system is appropriate for site, watershed, and wastewater flow/strength.	Prescribe a limited number of acceptable designs for specific site conditions.	Implement requirements for developing alternative designs that meet performance requirements for each site, position in watershed, and wastewater flow/strength.
Construction	Ensure installation as designed; record as-built drawings.	Inspect installation prior to covering with soil and enter as-builts into record.	Provide supplemental training, certification & licensing programs; provide more comprehensive inspection of installations; verify & enter as-builts into record.
Operation and maintenance	Ensure systems perform as designed.	Initiate homeowner education/ reminder programs that promote regular O&M (pumping).	Require renewable, revocable operating permits with reporting requirements; verifiable responsibility for proper O&M activities.
Residuals management	Minimize health or environmental risks from residuals handling/dispersal.	Require compliance with federal and state residuals disposal codes.	Conduct analysis and oversight of residuals program; Web-based reporting and inspection of pumping and ultimate disposal facility activities.
Training and certification/licensing	Promote excellence in site evaluation, design, installation, and other service provider areas.	Recommend use of only state licensed/certified service providers.	Provide supplemental training and certification/licensing programs in addition to state programs; offer continuing education opportunities, and monitor performance through inspections.
Inspections and monitoring	Document proper service provider performance, functioning of systems, and environmental impacts.	Inspection prior to covering; inspections prior to property title transfer; complaint response.	Require regional surface and ground water monitoring; Web-based system and operational monitoring; required periodic operational & installation inspections.

Conventional Sewer

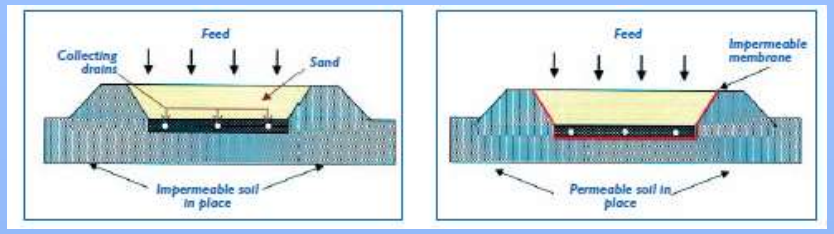
Decentralized Sewer

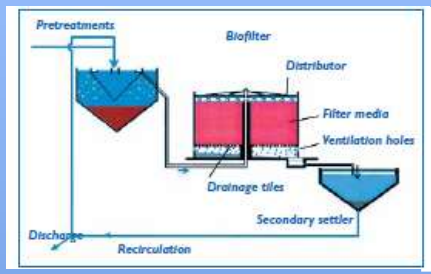
Figure 2.6. Estimated expenditures per capita and as % of GDP

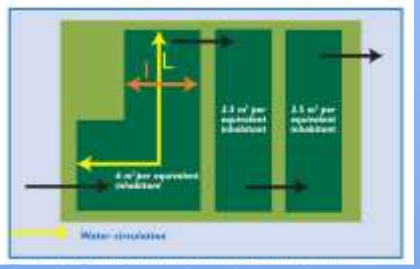


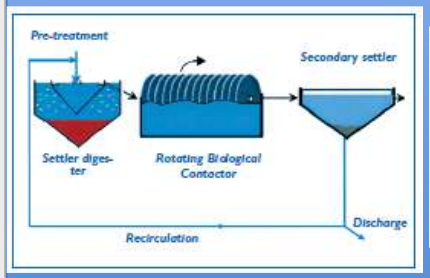
Note: Expenditure for Finland, Croatia and Sweden are underestimated due to data limitations.
Source: OECD analysis based on EUROSTAT (WSS-related public and household expenditures, GDP, population).

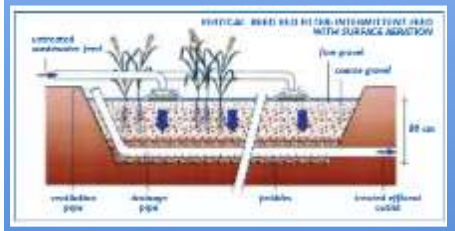
Recognized as an option

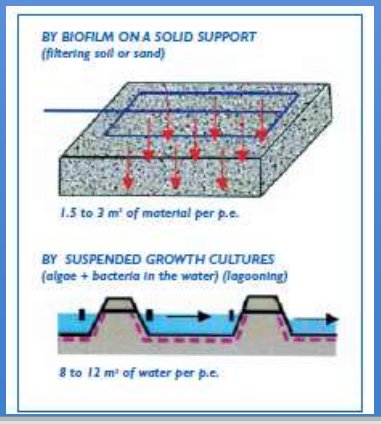


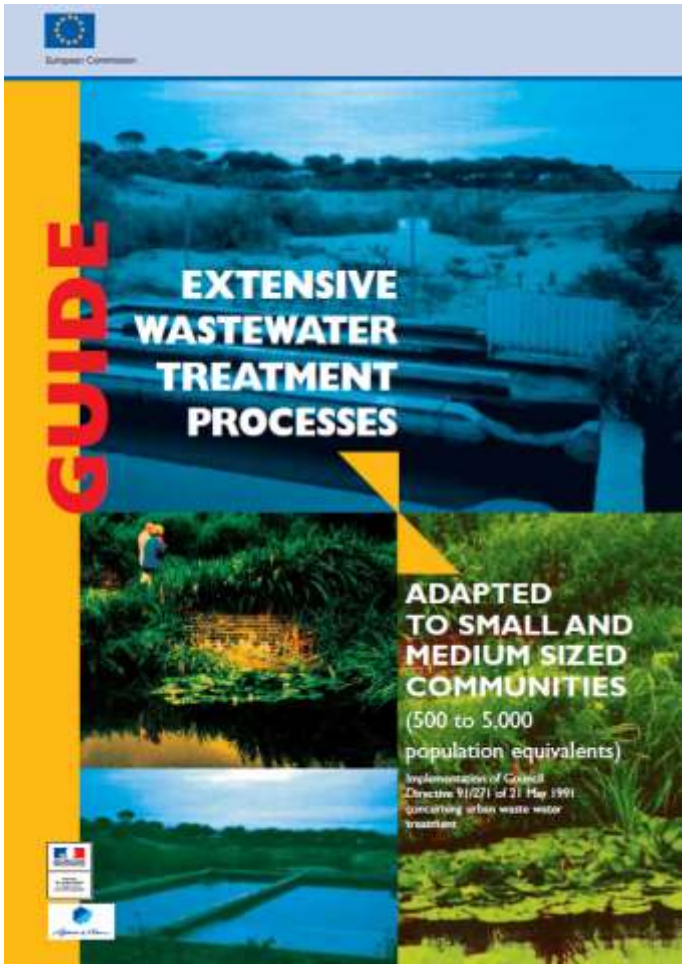












2001

On-site (stand-alone) treatment (septic tanks with subsoil or sand filters, cesspool, etc.) are not considered