Interreg
CENTRAL EUROPE
CWC
European Union
European Regional Development Fund

STATE OF THE ART STUDY ON THE POTENTIALS AND OBSTACLES OF CIRCULAR URBAN WATER MANAGEMENT IN CE

Deliverable: D.T1.2.5
Final Version
Prepared by EZAVOD
12 2019

CONTENT

1. Introduction

Analysis "D.T1.2.5 State of the art study on the potentials and obstacles of circular urban water management in CE" is part of the Activity "A.T1.2 EU level state-of-the-art desk-research and knowledge inventory" and it presents multidisciplinary scoping of already prepared following studies:

- D.T1.2.1 Analysis of the EU level policy and legislative framework linked to circular urban water management.
- D.T1.2.2 Collection of innovative solutions and good practices in urban water efficiency (WE), rainwater (RW) utilisation and grey water (GW) re-use.
- D.T1.2.3 Collection of smart governance solutions applicable in urban circular water management.
- D.T1.2.4 CE level analysis of projected climate change (CC effects) and induced risks on urban water systems.

Upon findings and conclusions identified in mentioned studies, a SWOT analysis emphasizing obstacles to overcome and potentials to exploit circular urban water management in Central Europe area will be prepared.

2. Conclusions of analyses of multidisciplinary scoping studies

2.1. Conclusions of analysis of the EU level policy and legislative framework linked to circular urban water management

Nowadays, almost a third of European countries are faced with water stress all year round and water scarcity is on the agenda in many EU countries. Taking into consideration climate change forecasts, the problem will increase in the next decades.

Water scarcity has negative impacts upon citizens and economic sectors (agriculture, tourism, industry, energy and transport). Water reuse in the EU today is far below its potential, therefore initiatives to address the problem of a too limited application of water reuse in EU are needed, in order to contribute significantly to alleviating water scarcity.

Taking into consideration presented facts, the “D.T1.2.1 Analysis of the EU level policy and legislative framework linked to circular urban water management”, revealed following:

- Although the need for a single set of standards for water re-use has been identified quite a time ago, already in the Blueprint (2012)[1] and taken up in the Circular Economy Action Plan (2015)[2] and Commission Work Programme, the common EU legal instrument on minimum requirements for water reuse is still missing.
- On the other hand, the experience from some Member States, related to implementation of national legal instruments on water reuse, show that over-regulation of water reuse can have also an opposite effect (case of France, Italy and Greece).
- The challenges of common regulation in EU arise from the fact that activities being regulated are often novel, we are facing geographical heterogeneity and different, already existing legal regimes in EU countries.
- Legal analysis showed that in EU currently only 6 members have standards defining minimum requirements for the water reclaim. In 5 countries (Cyprus, Greece, France, Italy and Spain) standards are compulsory and part of the water reuse legislation. In Portugal standards are enforced through permitting requirements. In Belgium, Denmark and Malta standards exist or are in preparation phase – no binding legislation yet.
- Majority of EU Member states govern water reuse through the enforcement of other existing legislation.

[1] European Commission, COM (2012)673, Blueprint for Safeguarding European Waters” (EU Water Blueprint)

[2] European Commission, COM (2015)614, Closing the loop – An EU action plan for the Circular Economy’

- In 2018, European Commission prepared ***Proposal for a Regulation of the European Parliament and of the Council on minimum requirements for water reuse***[3]**,** which is still in reviewing phase. The general objective is to contribute to alleviating water scarcity across the EU, in the context of adaptation to climate change, notably by increasing the uptake of water reuse for agricultural irrigation wherever this is relevant and cost-effective, while ensuring the maintenance of a high level of public health and environmental protection. More specifically, establishing an enabling framework through a common approach to water reuse in agricultural irrigation across the EU can facilitate a more efficient management of scarce water resources.

[3] European Commission, COM(2018) 337 final, Proposal for a Regulation of the European Parliament and of the Council on minimum requirements for water reuse

2.2. Conclusions of analysis Collection of innovative solutions and good practices in urban water efficiency (WE), rainwater (RW) utilisation and grey water (GW) re-use.

In the framework of this analysis project partners from participating Central Europe project regions and countries, were asked to identify innovative solutions and good practices in the following fields:

- Rainwater management: including harvesting, infiltration, retention Green roofs/facades, evaporation, cooling, irrigation, toilet flushing, discharge into water body
- Greywater recycling: including toilet flushing, irrigation, energy /biogas
- Wastewater reuse: including food production, animal feed, energy / biogas or industry

Each innovative solution/practice was analysed through following parameters:

- short description of the solution's concept
- location
- implementation field
- year of implementation
- involved partners
- funding body
- project's outcomes.

Conclusions of identified practices by countries

Country	Implementation field	Location	Funding
GERMANY	25 practices identified. Most practices, 17 are implemented in rainwater management, 8 grey water recycling and 5 wastewater reuse.	Majority practices are/were implemented on the city level, in Berlin	federal, local, private and EU funds
ITALY	13 practices identified. 6 practices are implemented in rainwater management, 5 in wastewater reuse and 3 greywater recycling	Majority practices are/were implemented on the city level	EU funding and private investors
POLAND	15 practices identified. 13 practices are implemented in rainwater management, 6 in greywater recycling	Majority practices are/were implemented on the city level	Local, national and EU funding

SLOVENIA	8 practices identified. 3 practices are implemented in rainwater management, 3 in wastewater reuse for industry purposes and 2 in greywater reuse.	Majority practices are/were implemented on the city level	EU funding
CROATIA	12 practices identified. 5 are implemented in wastewater reuse for agriculture purposes, 4 in rainwater management and 2 in greywater recycling and reuse.	Majority practices are/were implemented on the city level	EU funding
HUNGARY	2 practices identified, in the field of rainwater management	On the city level	local

2.3. Conclusions of analysis Collection of smart governance solutions applicable in urban circular water management

In order to tackle the issue of the water scarcity and too low exploitation of water reuse, EU Member States, would need to set a variety of smart governance solutions and initiatives to encourage larger water reuse:

- for households
- for agriculture
- for energy production and industry.

The analysis of "Collection of smart governance solutions" demonstrated, that current development and adoption of smart governance solutions applicable in urban circular water management on EU level is either low or absent.

2.3.1. Conclusions related to the top-down governance policies

Governments in EU Member states have available different top-down governance approaches, with which they could foster water reuse and sustainable water use:

- Legally binding rules
- (Soft) regulation (guidelines, recommendations)
- Education and information and
- Economic instruments,

but currently, the analysis showed, that for governments across EU, there is a lot of work ahead, the only exception is Cyprus.

In the following table, we can see overview of the good practice examples of top-down governance measures across the world.

Country/area	Governance measures	Benefits	Barriers
CYPRUS	Due to increase of droughts, government implemented several measures: - for water rationing - to increase public awareness on water conservation methods and water pricing (consultation campaigns and educational programmes) - for desalination plants and recycling methods -increase use of dams to enlarge water supply capacity.	- Only EU country with fully integrated legislation on urban wastewater treatment and discharge -"Not a Drop of Water to the Sea" policy to maximize capture of run-off by dam construction and handling wastewater (up to 90% reused)	- expensive storage infrastructure

Irvine Ranch Water District (CALIFORNIA, USA)	Due to periods of drought and seasonal fluctuations, following measures were implemented: -water reclamation plant and dual distribution system for recycling water was set-up, mostly used for landscape irrigation -water educational programmes for water reuse and conservation	- maximizing drinking water supplies by reducing the need of potable water for all purposes -long tradition of education programmes in the field of water management, high awareness among citizens	-seasonal storage problems -increased maintenance costs of recycled water systems
Montebello Forebay Groundwater project (CALIFORNIA, USA)	Implemented measure: due to high exploitation of existing groundwater and the need for water purchasing, groundwater recharge with recycled water was implemented	-with no groundwater recharge, water would have to be purchased, which would be more costly or the restriction of pumping water from aquifer would be needed	- extensive monitoring required to safeguard the quality of the water
San Antonio (TEXAS, USA)	Implemented measure: -construction of the system for water recycling system for non-potable use and conservation programme to reduce aquifer exploitation -education programmes for water conservation, pricing and leak detection	-lowering the pressure on existing water resources	-at the begging system operation problems, therefore additional customer trainings needed
West Basin Municipal Water District (CALIFORNIA, USA)	Implemented measures: -to reduce the region's dependence on imported water, recycling treated municipal wastewater and desalinating seawater system was set-up -educational programmes about water conservation and resource planning	-up to 50% less water imported -extensive ongoing public outreach educational programmes for school children, local communities, environmental organisations	/
CHICAGO, USA	Due to expected raise of water demand in next 20 years, measures to promote reuse, recycling and conservation of water prepared: -"Meter-save programme": free of charge residential water meters and conservation kits for citizens to promote water conservation -Rainwater harvesting memorandum: guideline paper for evaluating	-lowering the pressure on existing water resources early enough -high awareness of citizens about existing water resources	/

	rainwater harvest systems to be used to toilets.		
INDIA	Due to dry and wet seasons and different precipitation levels, many Indian cities decided to implement the measure of mandatory rain harvesting systems in the cities. For that purpose, financial incentives were available, to cover up-to 50% of investment costs for rain harvesting systems.	-low cost practice -improved meet for households during water scarcity periods -increased groundwater availability -reduced stormwater runoff (prevents flooding)	/

2.3.2. Conclusions related to bottom-up governance policies

In the research process of identifying bottom-up policies to foster water reuse, task leader, project partner POLIEDRA was faced with the challenge of not finding fully compliant bottom-up policy case studies, representing bottom-up policy making in the field of water reuse.

Due to mentioned fact, in this subchapter, bottom-up cases were chosen upon criteria of citizen's active participation in the projects:

- people involved in decision making process
- people involved in the development phase of the project.

Country/area	Bottom-up measures	Benefits	Barriers
Bucaramanga (COLOMBIA)	Implemented measure: co-design of greywater and rainwater harvesting systems and reuse, upon end-user preferences and water availability. In the design phase, questionnaire consultation was done, due to high water use in the highest socioeconomic households	-user acceptability asked in the form of questionnaire to determine type of criteria important to householders in the design of RWH and GWR system before actual investment implemented	-people's attitude towards alternative water supplies can limit utilisation of water reuse
Orange County (FLORIDA, USA)	Upon citizens' initiative, project for construction of water reclamation facilities, due to degradation of the lake and its fish habitat. Citizens, city, county and agriculture representatives cooperated in the development of the project	-environmental for surface waters -reduction of demand on the aquifer -dependable water source for agriculture use	-long consultation process of involved stakeholders before investment.

2.4. CE level analysis of projected climate change (CC effects) and induced risks on urban water systems.

CE level analysis of climate changes and future impacts, includes overview of observed climate changes in Europe in past decades, projected climate changes in the future, climate change impacts on environment and quality of life and presentation how climate changes will influence urban water systems across Europe and CE regions.

Summary of conclusions reveals following findings:

- [4]In the EU Member States, 91 455 fatalities caused by weather and climate-related extremes were noted over the period 1980-2017, monetary losses of disasters amounted to EUR 426 billion, 85% of fatalities were connected to heatwave events.
- The climate change in Europe can be observed in many variables: increasing land and sea temperatures, changing precipitation patterns, declining sea ice extent, decreasing of glacier volume and snow cover, rising sea levels, increasing frequency and intensity of climate-related extremes such as heat waves, heavy rainfall and droughts in many regions.
- Climate change is already affecting the environment, human health and economies across Europe. Changes in the hydrological cycle, in the freshwater system and in sea level are particularly important for safety and quality of life in the city. The table below contains the characteristics, the changes of which may affect the availability and quality of water.

Impacts of changes in climate on selected environmental system characteristics in Europe[5]

CHARACTERISTICS	IMPACTS OF CHANGES IN CLIMATE
Seas and coastal areas	Globally averaged sea surface temperature is projected to continue to increase, although more slowly than atmospheric temperature. All European seas have warmed considerably since 1870, and the warming has been particularly rapid since the late 1970s. The multi-decadal rate of sea surface temperature rise during the satellite era (since 1979) has been between 0.21°C per decade in the North Atlantic and 0.40°C per decade in the Baltic Sea. The Mediterranean Sea is expected to increase in temperature and also in salinity, triggered by higher evaporation and lower rainfall. An increase in harmful algal blooms, with increased risks to human health, ecosystems and aquaculture, has been projected for the North Sea and the Baltic Sea as a result of the projected warming. A rise in water temperatures due to climate change in the Baltic Sea is also contributing to a further expansion in oxygen-depleted "dead zones".

[4] Economic losses from climate-related extremes in Europe, published 02 April, 2019, https://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment-2

[5] Climate change, impacts and vulnerability in Europe 2016. An indicator-based report, EEA Report No 1/2017, European Environment Agency

Climate change adaptation and disaster risk reduction in Europe. Enhancing coherence of the knowledge base, policies and practices, EEA Report No 15/2017, European Environment Agency

	Europe is marked by increasing mean sea level with regional variations, except in the northern Baltic Sea, where the relative sea level decreased due to vertical crustal motion. Relative sea level change along most of the European coastline is projected to be reasonably similar to the global average (except the northern Baltic Sea and the northern Atlantic coast where sea level relative to land is rising slower than elsewhere or may even decrease). Sea level rise substantially increases the risk of coastal flooding, which affects people, communities and infrastructure.
River flows	Available studies suggest that run-off in near-natural rivers during the period 1963–2000 increased in western and northern Europe, in particular in winter, and decreased in southern and parts of eastern Europe, in particular in summer. Annual river flows are projected to decrease in southern and south-eastern Europe and increase in northern and north-eastern Europe. Climate change is projected to result in significant changes in the seasonality of river flows across Europe. Summer flows are projected to decrease in most of Europe, including in regions where annual flows are projected to increase. Where precipitation shifts from snow to rain, spring and summer peak flow will shift to earlier in the season. The reduction in winter retention as snow, earlier snowmelt and, in some cases, reduced summer precipitation are projected to lead to increases in river flows in winter and reductions in summer in the Alps. Reductions of flow can be exacerbated by water abstractions, especially in summer when consumption is highest, and input is typically low. These changes result in a further decrease of water availability in summer
River floods	River floods are a common natural disaster in Europe, and — along with storms — are the most important natural hazard in Europe in terms of economic damage. They are mainly caused by prolonged or heavy precipitation events and/or snowmelt. Almost 1 500 floods have been reported for Europe since 1980, of which more than half have occurred since 2000. Global warming is projected to intensify the hydrological cycle and increase the occurrence and frequency of flood events in large parts of Europe. Pluvial floods and flash floods, which are triggered by intense local precipitation events, are likely to become more frequent throughout Europe. The strongest increase in flood risk is projected for Austria, Hungary, Slovakia and Slovenia. In regions with projected reduced snow accumulation during winter, the risk of early spring flooding could decrease. However, quantitative projections of changes in flood frequency and magnitude remain highly uncertain.
Droughts	Drought has been a recurrent feature of the European climate. From 2006–2010, on average 15 % of the EU territory and 17 % of the EU population have been affected by meteorological droughts each year. In the 1990s and 2000s the drought hotspots were the Mediterranean area and the Carpathian Region. The frequency of meteorological droughts in Europe has increased since 1950 in parts of southern Europe and central Europe (Austria and Hungary), but droughts have become less frequent in northern Europe and parts of eastern Europe. Trends in drought severity show significant increases in the Mediterranean region (in particular the Iberian Peninsula, France, Italy and Albania) and parts of central and south-eastern Europe and decreases in northern and parts of eastern Europe. Available studies project large increases in the length, magnitude and area of meteorological and hydrological droughts events in most of Europe over the 21st century, except for northern European

	regions. The greatest increase in drought conditions is projected for southern Europe, where it would increase competition between different water users, such as agriculture, industry, tourism and households.
Water temperatures	Water temperatures is one of the parameters that determine the overall health of aquatic ecosystems. Water temperature in major European rivers have increased by 1–3°C over the last century. The annual average temperature of the Danube increased by around by 1°C during the 20th century. Several time series show increasing lake and river temperatures all over Europe since the early 1900s. Lake and river surface water temperatures are projected to increase further with projected increases in air temperature. Increased water temperature can result in marked changes in species composition and functioning of aquatic ecosystems. The number of days with water temperatures above 25°C, which is the threshold for significant stress to river fauna and flora, projected to increase.
Freshwater ecosystems	Freshwater ecosystems include lakes and ponds, rivers, streams, springs, bogs, and wetlands. Increasing water temperatures can lead to earlier and larger phytoplankton blooms and to species invasions. For example, the recent rapid spread of the highly toxic cyanobacterium *Cylindrospermopsis raciborski* throughout Europe and into other temperate regions has caused international public health concerns.

- The projected climate changes will be a challenge for cities in the 21st century in terms of water supply, distribution, wastewater collection and rainfall/ stormwater runoff. Risks to the proper functioning of Urban Water Systems, identified in ARC3.2 (IPCC, 2018c), include:

> increasing temperatures (with attendant changes in evaporative demands, availability, and quality);

> changing precipitation regimes;

> changing extreme weather regimes;

> sea level rise and storm surges;

> changing surface-water and groundwater availability and conditions.

The table below describes the effects of climate change- related hazards on the water system in the city.

Climate risk to Urban Water System[6]

CLIMATE RISKS	POTENTIAL CONSEQUENCES FOR URBAN WATER SYSTEMS
Warming temperatures	Warmer temperatures result in larger demands for water, particularly for household consumption and power plants cooling. Higher temperatures and heat waves typically increase water use for shower or bath and for irrigation / watering greens.

[6] Vicuña, S., Redwood, M., Dettinger, M., and Noyola, A. (2018). Urban water systems. In Rosenzweig, C., W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. Ali Ibrahim (eds.), Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network. Cambridge University Press. New York. 519-552

	In the heat waves, water supply companies can help residents survive the hottest days by installing sprinklers and pouring water on the streets. Greater water consumption also results from urban greenery watering. An increase in temperature can change water balance. Increased evaporation will lead to reduction of surface water resources and of river and stream flows. Further increases in temperature and the occurrence of droughts may limit the availability for industry and for power generation. Fossil-powered and nuclear electricity generators are sensitive to a reduced availability and increased temperature of cooling water, and to increased air temperature, which reduces their efficiency. The coal power plants with open cooling system require huge amounts of water for cooling (the 500 MW power plant draws approximately 500 million m^3 of water annually). This may affect the operation of water supply, treatment and wastewater disposal system which is also energy-consuming.
Changing precipitation regimes	Changing precipitation patterns, generally make wet regions in Europe wetter, particularly in winter, and dry regions drier, particularly in summer. Change in the nature of summer rainfall (more heavy than light precipitation), and winter (rain rather than snow) are expected in response to atmospheric warming. Consequently more runoff is taking the form of floods (e.g. flash flood) rather than steadier, more reliable, and manageable flows. Such changes in the timing and form of precipitation impacts the balance between the management of water supply and flood risk in cities. Heavy precipitation and flood can cause landslides damaging infrastructure. These mass movements are also danger for UWS. Urban water systems that depend on local surface water supply may be most instantly at risk related to water availability to changing precipitation regimes. Warmer temperatures and changing precipitation conditions can also impact cities depended on groundwaters, which have a much slower recovery rate than surface water sources. Climate change is likely to decrease surface water quality due to higher temperatures and changes in precipitation patterns.
Sea level rise and storm surges	The impacts of elevating sea level and extreme sea level fluctuations (e.g., inter-annual fluctuations, wind-driven waves, storm surges) will be superimposed. In cities located in coastal settings wastewater and sanitation systems have important hubs (e.g., treatment plants and outfalls) located at or very near sea level to take advantage of the gravity-feed and marine-outfall options. These hubs and systems will be among the infrastructure that is most immediately at risk by sea level rise and/or increased storm surge conditions. The human health may be at risk because of wastewater back up. Coastal cities with water supply systems depend on local groundwater sources can face risks of increased seawater intrusion into freshwater aquifers / reservoirs. The aquifer salinization can be caused by overexploitation of groundwater resources /coastal aquifers and changing precipitation, increased storm frequency, and sea level rise will exacerbating these problems. It can threat freshwater supply in long term.
Extreme events / heavy precipitation	More extreme precipitation could result in changes in frequency, extent, timing, and rapidity of stormwater runoff (flash floods). This could cause

	flooding in many urban settings, especially given the impervious surfaces of most cities. Furthermore, this could pose added risks to public health and safety, property, and infrastructure (including UWS). Water quality could be affected by these extreme runoff events due to the increased concentration and build-up of contaminants during dry or low-flow conditions that are then released into the water supply with increased water flow.
Changing water availability	Climatic pressures will impact on water availability, which depends not only on the amount of different water sources, but also on water quality. The combined effect of precipitation decrease and near-surface air temperature increase is expected to affect the hydrological cycle with a general decline in water availability (mainly Mediterranean area). The increased risks of water restrictions in Southern, Central, and Atlantic sub-regions can be expected. The hydrological system is projected to become more sensitive to extreme weather events like heat waves and droughts. Additionally decreasing ice cover in winter affects river and groundwater recharge. Another impact is modification of the annual water budget of river basins and the timing and seasonality of river flows, including an earlier decline in high flows from snowmelt in spring, an intensification of low flows in summer. The water availability can be also affected by river abstraction and from groundwater resources. The competition between different water users like agriculture, industry, energy and cities can rise in the dry period. With the projected increase in heavy rainfall events, the risk of surface and groundwater contamination is expected to rise. Hazards ranging from an increased concentration of pollutants (with negative health consequences) can be leaded by excess precipitation or drought, lack of adequate water flow for sewerage, and flood-related damage to physical assets.

- To build the city's resistance the effects of climate change, it is necessary to recognize the circumstances requiring action to ensure the safety of populations and security of assets in response to the anticipated risk or experienced impacts of climate change, i.e. adaptive needs should be identified. Adaptation needs are divided in five groups[7]:

> Biophysical and environmental needs: a need to protect and monitor ecological systems and their resources, improve and maintain, better understand and value ecosystem services.

> Social needs: social needs include people's security needs, human capacity and social capital to implement adaptation, education / learning on adaptation and access to information.

> Institutional needs: a need for institutions that provide conditions conducive to the implementation of adaptation activities, creating guidelines, incentives or restrictions, creating

[7] Noble, I.R., S. Huq, Y.A. Anokhin, J. Carmin, D. Goudou, F.P. Lansigan, B. Osman-Elasha, and A. Villamizar, 2014: Adaptation needs and options. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 833-868.

adaptation policies and programs, providing a clear legal framework, regulations and financing mechanisms that meet / reconcile the needs of various stakeholders.

- Need for engagement of the private sector: a need to manage climate risk within companies to protect their own interests, continuity of supply and markets. The private sector is a stakeholder and should therefore participate in adaptation activities and cooperate with other stakeholders. The adaptation creates new business opportunities in the areas of health, waste management, water management, sanitation, housing, energy and information.
- Information, capacity, and resource needs: a need to obtain and disseminate information, reliable scientific data, research and development, and transfer of knowledge and technology are needed. Implementing adaptation and responding to climate change requires financial resources.

3. SWOT analysis

3.1. Overview[8]

Europe's freshwater resources are under increasing stress in several regions, facing mismatch between demand and availability of water resources across both temporal and geographical scales. Overall water scarcity is more pronounced during the summer months (with 70 million inhabitants affected), while in winter it is estimated that 30 million people (6% of the total EU population) live under water stress conditions.

Societal changes such as population growth and diet changes in past decades also have an impact on the water use. Past analysis showed that the increase of animal and dairy products in people's diet increases the demand for water in the agriculture production.

It is expected that by 2030, water stress and scarcity will affect half of the European water basins. Water in Europe is used for a range of activities including agriculture, public water supply, electricity generation and industry. Agriculture is the most important category accounting for 36% of the total annual water use, followed by public water supply (32%).

In Europe more than 40,000 million m3 of wastewater is treated every year, but only 964 million m3 of this treated wastewater is REUSED[9].The potential for further uptake is huge, we could use 6 times the volume of treated water that is currently used.

As mentioned, the potentials for water reuse in EU are big, but the benefits and risks of its reuse must be considered, before actions will take place.

[8] EU-level instruments on water Reuse Final report to support the Commission's Impact Assessment

[9] https://ec.europa.eu/environment/water/pdf/water_reuse_factsheet_en.pdf

3.2. SWOT analysis of findings from EU desk research studies

SWOT analysis identifying obstacles and potentials of exploitation of circular urban water management in Central Europe regions.

STRENGTHS	OPPORTUNITIES
Environmental ✓ EU Member States share 60% of EU river basins, strong interest to work together on the issue of water scarcity. ✓ 40,000 million m3 of wastewater treated every year available for further use. Economic ✓ Available innovative solutions and good practices in the field of rainwater management in all CE partners' regions. Social ✓ Awareness and knowledge about the need to address the issue of water scarcity among experts.	Environmental ✓ Water reuse can increase the availability of surface water bodies and can serve as recharge of aquifers. ✓ In water-scarce areas, water reuse presents an alternative source and has positive influence on the stability of water supply. Economic ✓ Circular Economy approach, where water is used in loops and its use can have multiple dimensions. Understanding these is fundamental to realizing the opportunity and enterprise potential of water ✓ New technological solutions lowering the costs of the water reuse Social ✓ Water re-use as economic activity can have an impact on new employment opportunities
WEAKNESSES	**THREATS**
Environmental ✓ Currently too limited application of water reuse in order to contribute meaningfully to solving the problem of raising water stress and scarcity. Economic ✓ Linearity of current water systems in CE cities: water is most traditionally viewed at in a linear fashion ("take-make-dispose" strategy), does not have an economic value Social ✓ Missing common EU level legal framework on minimum requirements for water reuse ✓ Missing smart governance solutions to support water reuse (missing	Environmental ✓ Forecasted climate changes will be causing water scarcity and drought ✓ Risk to health and the environment, necessary to ensure the safety of population and environment in case of water reuse Economic ✓ Whether water reuse makes sense for a region, it depends also on its cost, compared with the costs of other feasible water management alternatives (e.g. new supplies, expanded conservation efforts) and the cost of not pursuing any water management changes.

information, knowledge, financial incentives)	Social ✓ Continuous global demographic growth and urbanisation ✓ Too strict future legal requirements that will hinder the further exploitation of water reuse ✓ In some countries, the public perception of water reuse can be negative and there may be a distrust related to further exploitation of water reuse

4. Conclusions

Water over-abstraction, in particular for agricultural irrigation, but also for industrial use and urban development is one of the main threats to the EU water environment. Immediate effects of droughts, such as damage to agriculture and infrastructure, as well as more indirect effects, a reluctance to invest in an area at risk, can also have a serious economic impact.

This trend is expected to continue with water scarcity no longer confined to a few corners of Europe, but already a concern across the EU with significant environmental and economic consequences. To respond to this problem, Europe's water resources should be managed more efficiently.

Central Europe regions and cities should consider managing water scarcity and droughts, highlighting that water saving must become the priority and all possibilities to improve water efficiency should be explored. As part of an integrated water management approach, in addition to water savings, treated wastewater from urban wastewater treatment plants should become a reliable alternative water supply for various purposes.

Furthermore, water reuse extends the water life cycle, thereby helping to preserve water resources and in full compliance with the circular economy objectives.

Setting harmonised minimum requirements (notably key parameters on reference pathogens) on the quality of reclaimed water and monitoring together with harmonised risk management tasks, would ensure clear rules for those engaged in water reuse and those affected, prevent potential obstacles to the free movement of agricultural products irrigated with reclaimed water and ensure health safety.

At present, water reuse is already identified and encouraged in provisions of two existing EU instruments, which however do not specify conditions for the reuse:

- The Water Framework Directive (2000/60/EC, WFD)[10].
- The Urban Waste Water Treatment Directive (91/271/EEC, UWWTD)[11].

A proposal for a Regulation would complement and be coherent whilst not lowering the applicable levels of environmental protection with the existing EU legislative framework on water.

Besides mentioned, governments should support water reuse with smart governance approaches and tools, raising awareness and knowledge among all relevant stakeholders and citizens. Due to projected climate changes and impacts, smart governance approaches will need to consider a set of adaptation needs, arising from climate changes (biophysical and environmental, social, institutional, engagement of private sector, information, capacity and resources) in order to tackle the climate challenges comprehensively.

[10] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

[11] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

Acting now would contribute to alleviating water stress where it is already a reality today in the EU and also prepare operators and farmers to be ready to act also in those parts of the EU which will experience increasing water stress in the coming years and decades.

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