

48th SESSION

Report
 CG(2025)48-14
 26 March 2025

Water resources under stress: towards better local and regional governance

Committee on Governance, Civic Engagement and the Environment (Governance Committee)

Co-rapporteurs:¹ Heiða Björg HILMISDOTTIR, Iceland (L, SOC/G/PD)
 Teuvo HATVA, Finland (R, ILDG)

Resolution 511 (2025) 2
 Recommendation 529 (2025) 4
 Explanatory memorandum 6

Summary

Water quantity and water quality are crucial for how the water resource can be utilised. Climate change and urbanisation put water use under increased stress. Present water use is mainly linear and not sustainable. Local and regional authorities are well placed to implement sustainable water governance thanks to local planning responsibilities, the proximity to all water users and the network of stakeholders who in some way affect water use in society. Sustainable water governance should be based on the physical movement of water (the watershed and the groundwater reservoir), since water moves across administrative and national borders. Water governance should be human rights oriented, emphasising equitable access to water, and democratic, involving all the levels of government and all the relevant stakeholders.

Sustainable water governance is a process that needs to be led and staffed by people, of whom local and regional politicians can form the backbone of the work for the future. This work must be organised inclusively, so as to ensure that human rights, social, economic, and environmental requirements are taken into account in the process. Water is a unique resource without which no living creature on Earth can survive. Strategic water governance by local and regional elected representatives is therefore vital.

1 L: Chamber of Local Authorities / R: Chamber of Regions.
 EPP/CCE: European People’s Party Group in the Congress.
 SOC/G/PD: Socialists, Greens and Progressive Democrats Group.
 ILDG: Independent Liberal and Democrat Group.
 ECR: European Conservatives and Reformists Group.
 NR: Members not belonging to a political group of the Congress.

RESOLUTION 511 (2025)²

1. The Congress of Local and Regional Authorities of the Council of Europe (“the Congress”) refers to:

a. the European Charter of Local Self-Government (ETS No. 122) (“the Charter”), especially its Articles 3, 4 and 9;

b. the European Outline Convention on Transfrontier Co-operation between Territorial Communities and Authorities (ETS No. 106), along with its Additional Protocol (ETS No. 159), Protocol No. 2 (ETS No. 169) and Protocol No. 3 (CETS No. 206);

c. the Priorities of the Congress 2021-2026, specifically Priority d: Environmental issues and climate action in cities and regions;

d. Congress Resolution 500 (2024) “Local and regional responses to natural disasters and climate hazards: from risk preparedness to resilience”;

e. Congress Resolution 489 (2022) “A fundamental right to the environment: a matter for local and regional authorities - Towards a green reading of the European Charter of Local Self-Government”;

f. Congress Resolution 278 (2009) “Public water and sewer services for sustainable development”;

g. Congress Resolution 183 (2004) “The quality and quantity of drinking water”;

h. Congress Resolution 163 (2003) “The role of territorial authorities in the management of river basins”;

i. Recommendation Rec(2001)14 of the Committee of Ministers to member states on the European Charter on Water Resources;

j. the European Green Deal, EU Water Framework Directive, Drinking Water Directive (revised), Groundwater Directive, Floods Directive and Urban Waste Water Treatment Directive;

k. United Nations General Assembly Resolution A/RES/70/169 (2016) “The human rights to safe drinking water and sanitation”;

l. the Sustainable Development Goals (SDGs) and Agenda 2030 for Sustainable Development of the United Nations, in particular SDG 1 “End poverty in all its forms everywhere”, SDG 3 “Good health and well-being”; SDG 6 “For clean water and sanitation for all”; SDG 11 “Sustainable cities and communities”; SDG 12 “Ensuring sustainable consumption and production patterns”, SDG 13: “Take urgent action to combat climate change and its impacts” and SDG 14 “For life below water”.

2. The Congress points out that:

a. fresh water is a vital resource for European societies, economies and the environment; sustainable use and conservation of freshwater resources - including lakes, rivers, groundwater, and wetlands - are essential for sustainable development and are key to eradicating poverty and ensuring human development, health and wellbeing;

b. access to drinking water and sanitation is recognised by the United Nations as a human right; however, many people still lack access to drinking water and sanitation, which exacerbates inequality and poses health and safety risks;

c. Europe’s water situation is increasingly precarious due to extreme weather conditions and climate-related disasters, as well as population growth, placing cities and regions at risk of water shortages, flooding, and pollution;

² Debated and adopted by the Congress on 26 March 2025 (see document CG(2025)48-14, explanatory memorandum), co-rapporteurs: Heiða Björg HILMISDÓTTIR, Iceland (L, SOC/G/PD) and Teuvo HATVA, Finland (R, ILDG).

d. the Russian Federation's war of aggression against Ukraine has far-reaching environmental consequences for water resources and infrastructure, highlighting the need for resilient water systems and robust water infrastructure protection;

e. sustainable water governance which addresses water-related challenges is crucial; it requires a strategic and inclusive watershed-based approach that uncouples economic growth from water consumption, and emphasises protection, reuse, and recycling of freshwater resources;

f. effective water governance requires a strategic, multi-level and multidisciplinary approach, with local and regional authorities, national authorities and other relevant actors - including civil society, academia and the private sector – collaborating to manage water resources and preserve ecosystems and biodiversity;

g. local and regional authorities are uniquely well-placed to develop water governance frameworks that meet their communities' specific needs.

3. In the light of the foregoing, the Congress calls on the local and regional authorities of Council of Europe member States to:

a. prioritise water governance and water security at the local and regional levels;

b. formulate and enforce water governance policies that ensure freshwater availability, accessibility, affordability, acceptability, quality, and safety for all, in the light of the human rights principles and standards;

c. integrate water management into planning and development, recognising water's interdependence with ecosystems and accounting for water balances, watershed boundaries and groundwater reserves, while incorporating flood zones into land planning;

d. promote efficiency, effectiveness and trust in water governance through multidisciplinary and multi-stakeholder collaboration involving public, private and civil society actors to strengthen local democracy and ensure cooperation between urban and rural areas connected by rivers and aquifers;

e. ensure sustainable freshwater management by setting consumption reduction targets, promoting circular water use, combating pollution and implementing effective water reuse schemes;

f. encourage the development of innovative technologies and business models that promote sustainable water use; and leverage public procurement to support smart water management solutions;

g. ensure that water service providers maintain the security and reliability of networks, invest in long-term infrastructure projects and monitor progress regularly;

h. engage the public through consultation, education and participation for sustainable water use, and regularly communicate the progress and requirements for smart water management.

4. The Congress calls on local and regional authorities and their national associations to take account of this resolution and the accompanying explanatory memorandum in their management of water resources. It also asks its statutory bodies to take the present resolution into account in their activities.

RECOMMENDATION 529 (2025)³

1. The Congress of Local and Regional Authorities of the Council of Europe (“the Congress”) refers to:

a. the European Charter of Local Self-Government (ETS No. 122) (“the Charter”), especially its Articles 3, 4 and 9;

b. the European Outline Convention on Transfrontier Co-operation between Territorial Communities and Authorities (ETS No. 106), along with its Additional Protocol (ETS No. 159); Protocol No. 2 (ETS No. 169) and Protocol No. 3 (CETS No. 206);

c. the Priorities of the Congress 2021-2026, specifically Priority d: Environmental issues and climate action in cities and regions;

d. Congress Resolution 500 (2024) “Local and regional responses to natural disasters and climate hazards: from risk preparedness to resilience”;

e. Congress Resolution 489 (2022) “A fundamental right to the environment: a matter for local and regional authorities - Towards a green reading of the European Charter of Local Self-Government”;

f. Congress Resolution 278 (2009) “Public water and sewer services for sustainable development”;

g. Congress Resolution 183 (2004) “The quality and quantity of drinking water”;

h. Congress Resolution 163 (2003) “The role of territorial authorities in the management of river basins”;

i. Recommendation Rec(2001)14 of the Committee of Ministers to member states on the European Charter on Water Resources;

j. the European Green Deal, EU Water Framework Directive, Drinking Water Directive (revised), Groundwater Directive, Floods Directive and Urban Waste Water Treatment Directive;

k. United Nations General Assembly Resolution A/RES/70/169 (2016) “The human rights to safe drinking water and sanitation”;

l. the Sustainable Development Goals (SDGs) and Agenda 2030 for Sustainable Development of the United Nations, in particular SDG 1 “End poverty in all its forms everywhere”, SDG 3 “Good health and well-being”; SDG 6 “For clean water and sanitation for all”; SDG 11 “Sustainable cities and communities”; SDG 12 “Ensuring sustainable consumption and production patterns”, SDG 13: “Take urgent action to combat climate change and its impacts” and SDG 14 “For life below water”.

2. The Congress points out that:

a. fresh water is a vital resource for European societies, economies and the environment; sustainable use and conservation of freshwater resources - including lakes, rivers, groundwater and wetlands - are essential for sustainable development and are key to eradicating poverty and ensuring human development, health and wellbeing;

b. access to drinking water and sanitation is recognised by the United Nations as a human right; however, many people still lack access to drinking water and sanitation, which exacerbates inequality and poses health and safety risks;

c. Europe’s water situation is increasingly precarious due to extreme weather conditions and climate-related disasters, as well as population growth, placing cities and regions at risk of water shortages, flooding and pollution;

³ Debated and adopted by the Congress on 26 March 2025 (see document CG(2025)48-14, explanatory memorandum), co-rapporteurs: Heiða Björg HILMISDÓTTIR, Iceland (L, SOC/G/PD) and Teuvo HATVA, Finland (R, ILDG).

d. the Russian Federation's war of aggression against Ukraine has far-reaching environmental consequences for water resources and infrastructure, highlighting the need for resilient water systems and robust water infrastructure protection;

e. sustainable water governance which addresses scarcity, abundance, and quality is crucial; it requires a strategic and inclusive watershed-based approach that uncouples economic growth from water consumption, and emphasises protection, reuse, and recycling of freshwater resources;

f. effective water governance requires a strategic, multi-level and multidisciplinary approach with local and regional authorities, national authorities and stakeholders - including civil society, academia and the private sector - collaborating to manage water resources and preserve ecosystems and biodiversity;

g. local and regional authorities are uniquely well-placed to develop water governance frameworks that meet their communities' specific needs.

3. In the light of the foregoing, the Congress calls on the Committee of Ministers to invite the respective national authorities of the member States of the Council of Europe to:

a. adopt and implement effective and sustainable water governance policies, with permanent coordination, planning and cooperation among central, regional, and local authorities across sectors (such as agriculture, industry, and energy) and on the respect of principles and standards on human rights, democracy and social inclusion;

b. prioritise water security in political agendas to support public health, economic stability and sustainable development while taking into account regional and cross-border resource management needs;

c. promote river basin and aquifer management policies and foster collaboration between urban and rural areas, engaging a wide range of stakeholders - including businesses, civil society, and youth - to address water-related challenges;

d. create an enabling environment through legislation, funding and research that empowers local and regional authorities to effectively implement water policies and drive innovation;

e. implement educational initiatives to raise awareness of the water cycle and include water governance in national curricula, providing training for professionals and the general public on sustainable water governance;

f. support universal access to water and sanitation, the protection of water resources and infrastructure and promote international cooperation and partnerships for sustainable and human rights-oriented water governance in Europe and beyond, advancing the UN Sustainable Development Goals.

4. The Congress calls on the Committee of Ministers and the Parliamentary Assembly of the Council of Europe to take account of this recommendation and its explanatory memorandum in their activities relating to Council of Europe member States in the field of management of water resources.

EXPLANATORY MEMORANDUM

Table of contents

1. INTRODUCTION	7
2. STATE OF PLAY FOR WATER RESOURCES AND MAIN CHALLENGES FOR MUNICIPALITIES AND REGIONS.....	8
3. THE ROLE OF LOCAL AND REGIONAL AUTHORITIES IN WATER GOVERNANCE	10
a) Local to National: Integrating Water Management and Sustainability Practices for Water Safety	10
b) Leading by example	11
4. STRATEGIC APPROACHES TO WATER GOVERNANCE	12
a) Multilevel water governance as high political priority	13
b) Strengthening the multi-stakeholder and multidisciplinary approach.....	14
c) Promoting a river-basin and aquifer approach	15
d) Improving cooperation between cities and their rural surroundings	15
5. OPERATIONAL AND TECHNOLOGICAL INNOVATIONS IN WATER MANAGEMENT.....	17
a) Improving the allocation and (re-)use of water.....	17
b) Adopting digital and artificial intelligence-based solutions	17
6. CONCLUSIONS	18
APPENDIX : CASE STUDIES OF BEST PRACTICES	20

1. INTRODUCTION⁴

1. This report was initiated by the Governance Committee following its debate on “Water resources under stress” held on 21 March 2023. The report draws on insights from this debate and a more recent debate entitled “Right to water under threat: what is at stake for territories?” conducted on 27 March 2024 by the Chamber of Regions during the 46th Session of the Congress.⁵ These discussions revealed the significant impact of various crises—including climate change, pollution, and armed conflict—on the water supply in Council of Europe member states, notably affecting areas such as the lower Dnipro River basin in Ukraine⁶.

2. The report advocates for sustainable urban and regional freshwater governance⁷ to address water-related challenges such as droughts, floods and pollution. It outlines methods, measures, and policies to assist local and regional authorities in implementing effective water governance, leading to smart water use in society. The report defines water governance as a framework that facilitates cooperation among all stakeholders involved in or affected by water use. Water policy refers to the laws, regulations and guidelines issued by political and administrative bodies. Water management encompasses the structures, such as treatment plants or reservoirs, used to manage water resources. While the report focuses primarily on water governance, it also addresses policy and management aspects.

3. Access to drinking water and sanitation is recognised by the United Nations as a human right⁸, encompassing the requirements for availability, accessibility, affordability, acceptability, quality, and safety. The European Charter on Water Resources, adopted by the Committee of Ministers of the Council of Europe,⁹ underscores the collective responsibility to protect water resources, stating that “everyone has the right to a sufficient quantity of water for his or her basic needs”. Moreover, the European Court of Human Rights¹⁰ has developed a case-law concerning environment, including with respect to quality and accessibility of water, which obliges not only to refrain from arbitrary interference but to take positive measures to protect the rights of individuals.¹¹

4. Several international actors, including UN Water,¹² OECD,¹³ Water Europe,¹⁴ SIWI¹⁵ and Global Water Partnership,¹⁶ contribute to the debate on and action for sustainable and equitable water governance.

5. Water is essential not only for human survival but also for maintaining ecosystems. It is essential for energy security, for instance through hydropower, which provides a flexible and emissions-free power source. Additionally, water security is intertwined with food security and sustainable economic

4 This report was prepared with contribution of Professor Kenneth M Persson, Sydsvatten AB, Malmö and Lund University, Sweden.

5 See Videorecording of the meeting, 27 March 2024.

6 Mykola Lukashuk, Ukraine, (R, ILDG), “The destruction of the Kakhovka dam deprived all of southern Ukraine of water”, debate on “Right to water under threat: what is at stake for territories?”, Congress Chamber of Regions, 27 March 2024.

7 Freshwater resources include lakes, rivers, groundwater, and wetlands.

8 See UN General Assembly Resolution A/RES/64/292 “The human right to water and sanitation”, 28 July 2010.

9 Recommendation Rec(2001)14 of the Committee of Ministers to member states “European Charter on Water Resources”, 14 October 2001.

10 For further details see also: Congress, “Human rights handbook for local and regional authorities – volume 3: environment and sustainable development”, 2022.

11 Guide to the case-law of the European Court of Human Rights – Environment.

12 UN water is a collaboration of over 30 United Nations organisations which carry out water and sanitation programmes. The coordination is done by UN Water. It is comprised of United Nations entities (Members) and international organisations (Partners) working on water and sanitation issues.

13 The OECD helps governments to manage their water resources and deliver water-related services effectively across economic sectors and policy agendas. For more details see “OECD Water governance” and “Net Zero+: The OECD Horizontal Project on Climate and Economic Resilience”.

14 Water Europe is a member led organisation for different partners in the water area, such as NGOs, cities, regions, companies, universities, and research institutes, presently with around 250 members from 27 different European countries. Water Europe develops analysis and strategy documents, presents innovations, and supports meetings and discussions for building a future where the value of water is fully acknowledged and leveraged for the greater good of society, economy, and environment.

15 Stockholm International Water Institute (SIWI) is a research institute mainly funded by the Swedish Government and project funds and based on the vision of a “Water Wise World” – a world that recognises the value of water and ensures that water is inclusively shared and used sustainably, equitably, and efficiently for all. Its mission is to strengthen water governance for a just, prosperous, and sustainable future, by for instance writing policy briefs, reports, and arranging the World water week in Stockholm every year. For more details see Water Governance Facility, “Interactions between the Global Biodiversity Framework and the Human Right to a Healthy Environment, and implications for water governance”, Stockholm, Sweden, 2024.

16 Global Water Partnership is an organisation of organisations, with more than 3500 partners from 180 countries. Global Water Partnership offers a platform where water actors at global, regional, national, and local levels can share water insights, access technical assistance and policy guidance for the smart management of water resources.

development. The equitable distribution and management of water resources are crucial for ensuring social justice and upholding democratic principles, as they allow all to benefit from this vital resource. Water security cannot be neglected in the planning and implementation of a sustainable future.

6. Two key methodologies for implementing effective water governance are Integrated Water Resources Management (IWRM) and Water-Energy-Food nexus analysis (WEF). IWRM promotes coordinated management of water, land and related resources to maximise economic and social welfare while sustaining ecosystems. This approach aligns with democratic governance by fostering inclusive and participatory decision-making processes that address the needs of all stakeholders. The WEF nexus emphasises the interdependence of water, energy and food, providing a holistic framework to balance resource use across sectors and avoid fragmented approaches. Both approaches underscore the need for democratic governance structures that allow for broad participation and accountability in the management of these critical resources, thus contributing to the Sustainable Development Goals (SDGs).

7. European and international stakeholders, such as NGO Water Europe, emphasise that creating a water-smart society requires joint efforts and strong political leadership.¹⁷ Adopting adequate legislation and risk management plans, strengthening financial support and promoting innovations, through measures like water-oriented living labs are essential steps. Sustainable water use, including water reuse and hybrid grey-green infrastructure solutions should be prioritised. This approach views wastewater not as waste but as a circular resource in urban, rural and industrial contexts.

8. Ensuring long-term water security in the face of climate change and demographic shifts requires a multi-level, multidisciplinary strategic approach. Local and regional authorities are crucial in this endeavour, capable of addressing social justice and environmental sustainability¹⁸ alongside technical solutions. They are well-positioned to implement and innovate in water governance through local policies and action plans that enhance resilience, equity, and safety, leveraging digital and artificial intelligence solutions. They have typically direct contacts with the water users and can communicate, inspire, and assist stakeholders towards smarter water use, not least by offering test-beds where techniques can be tested.¹⁹

9. Substantial funding at national and European level for water research is needed, yet the transfer of research results into governance plans must also be facilitated. A vast part of present water research results is not sufficiently integrated in the development and update of water governance strategies.

2. STATE OF PLAY FOR WATER RESOURCES AND MAIN CHALLENGES FOR MUNICIPALITIES AND REGIONS

10. Precipitation, including rain and snow, is the primary source of freshwater resources on land. Through processes of evaporation and plant transpiration, water returns to the atmosphere. The balance results in surface runoff and groundwater flow, essential for all terrestrial and aquatic life and the formation of brackish zones where freshwater and seawater mix. The consistent availability of freshwater is crucial for local communities, agriculture, forestry, biodiversity, and maintaining a healthy environment.

11. Additionally, in regions where natural freshwater availability is insufficient, desalination provides a critical water source. Desalination, which converts brackish or seawater into freshwater, is particularly important in arid regions where other freshwater resources are unavailable. Desalination, particularly through the development of reverse osmosis technology, has expanded significantly over the past sixty years. In Europe, desalination is used for municipal water supply in dry areas in Greece, Cyprus, Malta, Italy, and Spain.²⁰ However, the high energy demands of desalination plants make the process costly - typically two to three times more expensive than other freshwater sources. Additionally, the environmental impact of desalination must be carefully managed, as the process produces a salty residual that can harm local ecosystems if not properly handled.

12. In addition to sourcing freshwater through natural means or desalination, the use of water in society spans a multitude of purposes. Generally, most water resources are preserved post-use, except in

¹⁷ Water Europe, "The Value of Water – Towards a Water-Smart Society", 2023.

¹⁸ Environmental Solutions, "Environmental Impact Assessment", Science Direct, 2005.

¹⁹ Water Europe, "Atlas of the EU Water Oriented Living Labs", 2019.

²⁰ Presently, Spain is the fourth in world in desalination capacity, behind Saudi Arabia, the US, and the United Arab Emirates.

agriculture and forestry, where water is lost through plant transpiration during growth. However, societal use often deteriorates water quality, necessitating effective treatment before water can be reintroduced into the cycle. Industrial and municipal wastewater treatment can restore water quality if executed correctly. Treated wastewater can then enter the water cycle again if it is not lost due to evaporation or transpiration. This recycling can be repeated many times if the wastewater treatment restores the water quality.

13. The availability and quality of water resources are increasingly influenced by broader factors such as climate change, urbanisation, and economic development. Climate change projections reveal a typically North-South pattern across Europe for water availability. Overall, Southern European countries are projected to face decreasing water availability, particularly Spain, Portugal, Greece, Cyprus, Malta, Italy, and Türkiye. Central and Northern European countries show an increasing annual water availability. Decreased water availability increases the need for irrigation in agriculture if this should continue. Urbanisation increases the need for investments in water infrastructure in the growing cities, while the population in rural areas may decrease.

14. Similarly, UN Water highlights that water and climate change cannot be separated. Extreme weather events are making water resources more scarce, more unpredictable, and more polluted. These impacts throughout the water cycle threaten sustainable development, biodiversity, and people's access to water and sanitation. Flooding and rising sea levels can contaminate land and water resources with saltwater or faecal matter, and cause damage to water and sanitation infrastructure, such as waterpoints, wells, toilets, and wastewater treatment facilities. Glaciers, ice caps and snow fields are rapidly disappearing. Meltwater feeds many of the great river systems. Volatility in the cryosphere can affect the regulation of freshwater resources for vast numbers of people in lowland areas. Droughts and wildfires are destabilising communities and triggering civil unrest and migration in many areas. Destruction of vegetation and tree cover increases soil erosion and reduces groundwater recharge, increasing water scarcity and food insecurity. Growing demand for water increases the need for energy-intensive water pumping, transportation, and treatment, and has contributed to the degradation of critical water-dependent carbon sinks such as peatlands. Water-intensive agriculture for food production and for growing crops used as biofuels, can further exacerbate water scarcity.

15. In addition to natural and economic pressures, armed conflicts can also severely impact water resources and infrastructure. The Russian Federation's war of aggression against Ukraine has caused extensive damage to irrigation, water supply, sanitation and water ecosystems, and flooded large areas, leaving millions of people without access to safe water. The destruction of the Kakhovka dam in 2023, for instance, unleashed devastating flooding, contaminated soil and water, claimed the lives of hundreds of people and forced thousands to flee.²¹ According to the third Rapid Damage and Needs Assessment (RDNA3)—undertaken jointly by the World Bank, the Government of Ukraine, the European Commission, and the United Nations, and covering 2022-2023, reconstruction costs resulting from the destruction of water infrastructure vital to the agricultural sector, such as irrigation canals, pumps and reservoirs, were estimated at \$10.7 billion over the next decade. Destruction of networks and infrastructure for municipal water supply and sanitation so far result in reconstruction and recovery needs at \$11.1 billion for 2024-2033, while another \$ 665 million would be needed for capacity building activities to strengthen environmental governance, mainly for emergency containment and clean-up of pollution.²² As the Russian war of aggression against Ukraine continues, damage to water infrastructure has continued and even increased. The Register of Damage for Ukraine set up by the Council of Europe is now operational and will play a leading role in calculating the total amount of damage to public and private property and resulting reconstruction costs, as well as their recovery as part of a future compensation mechanism. Lessons learned from Ukraine include the importance of physical and organisational protection of vital water infrastructure and the importance of emergency water supply.

16. Water governance and water policies in Europe must be able to address water security, sustainability, and resilience simultaneously. These factors are influenced by population, climate, topography, land use, and water abstraction. The regionalised Water Exploitation Index (WEI+)²³, which is one method to measure water use against renewable sources, indicates water scarcity levels. Both water use and renewable water resources can be defined in different ways, but generally the use of water excludes hydropower stations but includes all other economic activities in the watershed.

21 Kullab Samya and Novikov Illia, "Takeaways from AP investigation into Russia's cover-up of deaths caused by dam explosion in Ukraine", *Associated Press News*, 28 December 2023.

22 World Bank, "Ukraine – Third Rapid Damage and Needs Assessment (RDNA3): February 2022- December 2023 (English)", Washington, D.C. : World Bank Group., 31 December 2023.

23 European Environment Agency, "Water Scarcity Conditions in Europe (Water exploitation index plus)", 13 January 2023.

Renewable water is defined as the net amount of water in the river basin plus upstream water coming to the location. WEI+ is an important parameter to follow and targeted in UN Sustainable Development Goals 6.4.2 indicator *Level of water stress: freshwater withdrawal as a proportion of available freshwater resources*. A WEI+ over 20% signifies water scarcity, and over 40% indicates severe scarcity. Despite a 15% decrease in water abstraction from 2000 to 2019, the area affected by water scarcity in Europe has remained unchanged.

17. Effective water governance and policy in Europe must simultaneously address water security, sustainability, and resilience. However, achieving these goals is hindered by the lack of a comprehensive, up-to-date database on water resources, particularly concerning groundwater, which constitutes about 99% of Europe's freshwater. One exception is Denmark, which monitors groundwater through GEUS, which includes quality and level measurements available in the national JUPITER database, helping all stakeholders access up-to-date water resource information.²⁴

18. In addition to data challenges, Europe faces growing pressures from urbanisation, population growth, and climate-related disasters, including droughts and floods, all of which exacerbate water management issues. Challenges such as poor governance, insufficient wastewater treatment, pollution, environmental degradation, aging infrastructure, information asymmetries, sectoral fragmentation, and increased competition for limited resources further complicate water management and highlights the need for sustainable water governance.

19. Given the pressures of urbanisation and the need for robust water infrastructure, municipalities and regions play a critical role in water management, often handling urban planning, infrastructure, and public investment. However, most municipalities have limited capacities for water management because of their relatively small size.²⁵ Therefore, fostering inter-municipal cooperation or regional integration is essential for effective water management. Such cooperation, ideally through river basin councils, can improve development of water balances in the watershed, decision-making, resource allocation, and reduce costs associated with water governance.

20. To implement effective water governance, sufficient staffing is necessary for the guidance, monitoring, evaluation, and maintenance of water policies at national, regional and local levels. Good decision-making needs to be followed with a capacity in society to control, advise and supervise all stakeholders in their work towards smart water use. Here, municipalities and regions can support in various ways including through public awareness campaigns, ensuring adherence to rules on water use and discharge and leading by example by implementing demonstration projects in schools or other public venues.

21. Alongside adequate staffing, pricing mechanisms also play a crucial role in water management. Water pricing significantly influences household water consumption as demonstrated by an EEA study across eight EU countries²⁶. While higher water prices typically lead to reduced consumption, combining pricing with non-pricing measures like flow control, water-saving devices, and educational campaigns proves most effective to decrease water consumption. As most water utilities are municipally controlled, using tariff structures can effectively guide consumers towards smarter water use. The value of water can be very tangible through a well communicated water price. Utilities in countries with relatively high price of municipal water have learned that it is central to communicate the background to the price level and how funding is used to improve water supply and sanitation.

3. THE ROLE OF LOCAL AND REGIONAL AUTHORITIES IN WATER GOVERNANCE

a) Local to National: Integrating Water Management and Sustainability Practices for Water Safety

22. Local and regional authorities are best placed to manage water policy and communicate its purpose, thanks to their local knowledge and close contact with citizens. This responsibility extends to

²⁴ *De Nationale Geologiske Undersøgelser for Danmark og Grønland (GEUS)*, [National Søg i Jupiter Database for groundwater \(in danish only\)](#).

²⁵ The average population for an EU municipality in 2016 was 4 015, excluding Cyprus and France, where no detailed population for municipalities were reported to Eurostat in 2017. See Eurostat, ["Local administrative units \(LAU\)", NUTS \(Nomenclature of territorial units for statistics\)](#).

²⁶ European Environment Agency, ["Water management in Europe: price and non-price approaches to water conservation"](#), last modified on 25 March 2021.

ensuring the security and resilience of water and wastewater facilities, which are vital to public health and safety.

23. To achieve this, municipalities can request operators initiate a comprehensive risk and vulnerability analysis of the plant, a continuity planning for times of crisis and water scarcity, and incident reporting system. The analysis should include an estimate of the probability of an unwanted event and the consequences of such an event occurring. Incident reporting, experiences from the industry in general and contacts with the municipality's security coordinator and the local police authority can be helpful in assessing the likelihood of various events. Since it can be difficult to assess the probability that an antagonistic event may occur, it is more appropriate to focus on what consequences different events can have to assess what level of security is needed. It is important to consider where in the process the water and sanitation system is most vulnerable and may cause unhygienic effects in society. Examples of unwanted events that can be addressed in a risk and vulnerability analysis are break-ins in reservoirs or waterworks, chemical or microbiological contamination of the raw water, sabotage of the IT system, threat of contamination of drinking water supplied to high-risk subscribers (certain government functions, certain food industry) and arson in the waterworks. Physical protection of the plants may be needed, such as area protection, camera surveillance, outdoor lighting, burglar alarms, locking systems, etc.

24. Central governments also play a crucial role in setting standards and coordinating national water management efforts. In response to emerging challenges such as water scarcity, some European central governments are now creating national water plans. Ideally, these plans are developed using a multi-level governance approach based on input from local and regional levels of government.

b) Leading by example

25. Effective water governance at the municipal or regional level can serve as a model for others. Larger municipalities and regions can lead by example in water management, similarly to the role they already play in leading efforts to reduce greenhouse gas emissions. Municipalities and regions thus play a key role in efficiently managing water resources. They ensure access to quality drinking water and sanitation services. They also play an important role in preserving ecosystems and biodiversity, through public investment, urban planning, and infrastructure. Investment and re-investment in infrastructure offers potential for innovative solutions for water and sanitation services. Decisions on local land use can in many instances support efficient water management. Urban green areas help mitigate flooding and counteract heatwaves through evaporation and transpiration processes. Blue-green solutions are a methodology that focus on the adoption of nature-based solutions to the problems mentioned above, for instance by integrating green spaces, trees, and natural drainage within urban environments. It's an approach that encourages developers and planners to also consider the co-benefits for a wider group of stakeholders.

26. Effective water governance includes not only managing water resources efficiently but also implementing innovative solutions such as blue-green infrastructure, which integrates nature-based solutions into urban planning. Blue-green solutions on the ground, on walls and roofs have several positive effects. They have a positive effect on people's wellbeing but can also slow down storm water resulting from heavy rain, reduce the temperature in urban heat spots in the city, reduce noise and scrub the air of pollutants. These solutions can be included in urban planning and applied in urban development for new areas, but also be used in existing areas. Further on, many regions and municipalities are often themselves major landowners and have the direct opportunity to apply water planning and lead by example on their own land and properties. Smart water use in schools, kindergartens, hospitals, sports arenas, parks, and other public facilities can be models for private actors to follow. Public land and properties can also be offered as test-beds for water innovation solutions. Reducing the risk of flooding in urban areas can be supported by standards for maximum acceptable run-off water from a plot to plots downstream and to stormwater drainage systems.

27. Climate change scenarios indicate that most regions and municipalities will see an increase in the intensity and frequency of extreme weather events with negative effects on buildings, infrastructure, and environment. This results in the need to develop regulations and practices to combat these challenges. Stormwater floods may cause costly damage to buildings and infrastructure in affected areas. As refurbishing the entire stormwater drainage network within a short time frame would be prohibitively expensive, adaptation of stormwater management using measures that retain water locally have been prioritised in many instances.

28. On-site water retention systems can be used in urban areas to limit the rate of discharge from a site to the legal point of discharge, freeing up capacity in the stormwater drainage system and reducing flooding during more extreme rainfall events. Measures at each plot can be set in the planning phase by defining a maximum permissible drainage flow from a plot to the stormwater drainage system (for instance, maximum 1 L/ha and second). This can be achieved by controlling post development flow rates to a pre-determined level, and temporarily storing excess runoff in storage tanks or pipes within a site boundary. Excess flow must be stored with the help of rainwater harvest tanks, oversized pipes, increased local groundwater recharge, etc.

29. Municipalities can also adopt Sustainable Urban Drainage Systems (SUDS). Such systems implement a range of technologies and techniques that mimic natural drainage processes. SUDS minimise surface water run-off and flood risks in an environmentally friendly way, using natural water systems such as ponds, wetlands, and marshes. These systems offer multiple benefits, including increased biodiversity and climate adaptation. They are especially valuable in urban areas with limited space for green infrastructure, where traditional flood control measures might be less effective.

30. Several cities have committed to becoming climate neutral within 10-20 years and are exploring various ways to reduce greenhouse gas emissions. For instance, the 'Viable Cities' initiative²⁷ includes 23 Swedish cities collaborating with national agencies to achieve climate neutrality by 2030. Similarly, Stockholm's Climate City Contract 2030²⁸ exemplifies a multi-level governance approach, fostering cooperation across cities, businesses, academia, and civil society. Additionally, the Carbon Neutral Cities Alliance showcases an international effort, where major cities aim for carbon neutrality within 10-20 years through innovative policies and solutions. ICLEI Local governments for sustainability, an international network for cities and regions, gathers 1125 member cities and regions from around the world including 163 from Europe. ICLEI works with five areas – zero emission development, nature-based development, circular development, resilient development, and equitable development.

31. Just as cities and regions are leading the charge towards climate neutrality, they can also adopt decentralised mechanisms to improve water management. These efforts should aim to equitably meet societal needs for water while preserving biodiversity. Effective water management requires collaboration among all stakeholders—cities, businesses, academia, and civil society. The appendix details several best practices from various cities and regions.

4. STRATEGIC APPROACHES TO WATER GOVERNANCE

32. While local and regional authorities play a key role in implementing practical water management tools, it is important to distinguish between water governance and water management. Water governance refers to the frameworks and policies that enable effective management. There are multiple dimensions of water resources management including: quantity, quality, disaster risk reduction and related services, transboundary water cooperation, climate change adaptation, water integrity and accountability, gender, and human rights, all of which intersect with water governance. Many elements and principles of water governance can be identified in IWRM. Improvement in water governance rests on achieving a balance between maintaining ecosystem integrity and socio-economic development to ensure both environmental and economic sustainability. This requires continuous attention and responding to emerging challenges in water governance, such as: population growth, economic growth, diversity, increasing urbanisation, poverty, local, national, and international conflicts, climate change, and other global environmental crises.

33. Sustainable water use and management are crucial for maintaining high-quality groundwater, seawater resources, and ecosystems. Transitioning to a circular economy offers a strategic opportunity to enhance technological advances, increase efficiency, and achieve the Sustainable Development Goals.

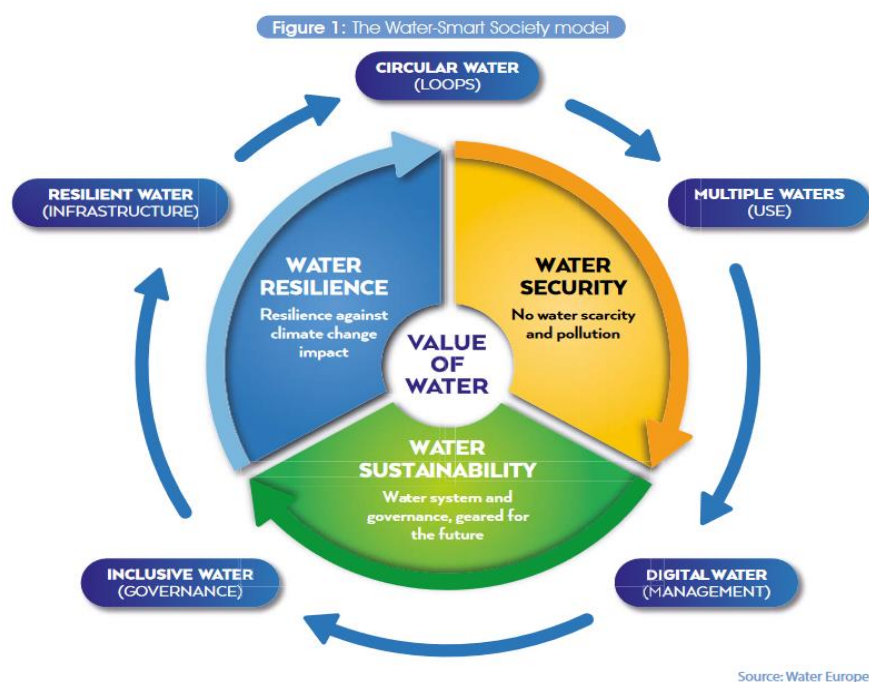
34. Figure 1 illustrates the Water Smart Society model developed by the NGO Water Europe, which maps the complex and interlinked conditions that influence water use and management in society.

²⁷ See [Carbon Neutral Cities Alliance](#).

²⁸ Viable Cities, Stockholms Stad, "Climate City Contract 2030". Version 2023.

35. Municipalities and regions should prioritise water security on their political agendas for multiple reasons: it supports social and public health, contributes to a pleasant and healthy environment, fosters cultural development and recreational opportunities, and bolsters employment, economic stability, and local or regional development.

36. The model presented in Figure 1 emphasises several mutually dependent dimensions crucial for effective water management. These include governance structures that facilitate collaboration between urban and rural areas and the integration of innovative practices that enhance efficiency by smart water use, and sustainability.



a) Multilevel water governance as high political priority

37. Water crises pose significant governance challenges, necessitating a comprehensive multi-level governance approach. While local and regional authorities play a crucial role, effective management must involve all levels of government, businesses, and civil society. This collaborative approach helps address overlapping water interests and ensures that different water qualities are appropriately managed for diverse purposes, as illustrated by the concept “Multiple Waters” in Figure 1.

38. Multi-level water governance requires multi-level planning, coordination, cooperation, and consultation. Effective governance, termed “Inclusive Water” in Figure 1, ensures that knowledge about water usage and resources is shared transparently. This not only enhances water use efficiency among all stakeholders but also plays a critical role in mitigating water crises.

39. Establishing dynamic water accounts is essential for providing accurate, real-time data on freshwater availability, referred to as “Digital Water” in Figure 1. Just as a financial balance sheet is vital for financial planning, a detailed inventory of water resources is crucial for developing effective and equitable local and regional water policies.

40. Cities and regions are uniquely positioned to lead in implementing Integrated Water Resources Management (IWRM), which aims to “coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare benefits in an equitable manner without compromising the sustainability of vital ecosystems”.²⁹

²⁹ United Nations, International Decade for Action 'Water for Life' 2005-2015, *Integrated Water Resources Management (IWRM)*: Global Water Partnership, "The Need for an Integrated Approach".

41. Water management and governance should be guided by comprehensive long-term strategies, incorporating both immediate and extended measures. These strategies must be adapted to local contexts, whether at the river basin or aquifer level, and should include considerations for transboundary resource management and collaboration when applicable.

42. Groundwater governance is an important subarea of water governance. Sustainable groundwater supply depends on effective rainwater recharge and innovative stormwater management, such as blue-green infrastructure, which reduces pollution and aids groundwater replenishment. The use of land directly impacts both the availability and quality of surface water and groundwater.

b) Strengthening the multi-stakeholder and multidisciplinary approach

43. Effective water governance requires a multi-stakeholder governance approach, bringing together mayors and local and regional elected representatives, businesses, and civil society, including youth. This inclusive strategy ensures that diverse perspectives and needs are considered in water management decisions.

44. Multidisciplinary systems such as the water-energy-food nexus and the green economy are essential frameworks for broadening stakeholder involvement in water management. These systems facilitate integrated decision-making that encompasses various sectors and their interconnected impacts on water resources.

45. Effective governance also hinges on continual updates and sharing of reliable information regarding water usage and needs. This transparency supports informed decision-making and enhances collaborative efforts among all stakeholders.

46. Moreover, raising public awareness and promoting understanding of water-related issues are critical. Initiatives should encourage public participation in sustainable water management practices. While industry and agriculture account for a large portion of freshwater usage, household consumption—though typically less than 20% of all freshwater use—also highlights the importance of inclusive water conservation efforts across all sectors. Addressing knowledge of available water resources helps stakeholders to identify more opportunities for circular water use and decreasing WEI+.

47. Communicating water governance ambitions effectively is crucial, as stakeholders may initially feel overwhelmed by the changes these ambitions entail. Building trust and ensuring that the community feels heard can mitigate negative reactions. A case study from Norway on stormwater management offers four key recommendations for improving communication between planning offices and local communities.³⁰ These recommendations can help build trust and establish a more collaborative relationship between the planning office and the community, ensuring that residents feel heard and that their concerns are addressed effectively. These actions will build trust and demonstrate that the planning office values the community's input and involvement.

- 1) Consult with residents before initiating pre-project planning: The planning office should engage with residents and stakeholders to understand their concerns and wants. This can involve organising meetings or focus groups, sending out surveys, or other methods of community consultation.
- 2) Use clear and empathetic language: During meetings, the planning office should use clear and simple language to explain the project and its potential impact on the community. They should also demonstrate empathy by actively listening to residents' concerns and following them up in a timely manner.
- 3) Build relationships with local representatives: The planning office can work with the local community to identify and facilitate communication and engagement with local leaders. This can involve organising joint meetings or events, leveraging local networks to reach more residents, and establishing ongoing communication channels between the planning office and the community.

30 Thodesen, B.O.; Andenæs, E.; Kvande, T. "Implementing Sustainable Urban Drainage Systems: Themes of Cultural Conflicts and Public Resistance – A Case Study", *Land* 2024.

- 4) Follow up with residents: The planning office should follow up with residents after meetings or consultations to address any remaining concerns or questions. They can also open direct channels to provide information on how residents can stay engaged with the project and provide feedback.

c) Promoting a river-basin and aquifer approach

48. In Europe, water governance is increasingly organised within the framework of water basins, as prescribed by the EU Water Framework Directive. For instance, France has established six water basins on its mainland to enhance the management of local water concerns and ensure adherence to hydrological logic.

49. Decentralisation reforms in Europe have led to the development of cross-regional and cross-river basin management strategies. Municipalities and regions play a crucial role in the effective implementation of these strategies by actively and constructively participating in river basin management committees. Including a broad range of stakeholders in the basin ensures full transparency in water allocation and clarifies the purposes for which water is used.

50. Aquifers, which do not always align with river basins, provide about 58% of the municipal drinking water in Europe, with 41% coming from surface water and 1% from desalinated sources³¹. Groundwater is also vital for crop irrigation. However, the intensive use of groundwater for irrigation can lead to the depletion of water tables, which reduces its availability for future use and causes various environmental issues such as increased salinity, stream depletion, and land subsidence. These issues can significantly affect agricultural productivity and the broader environment. Effective management of aquifers is crucial and should include protective measures in abstraction and recharge areas, pollution control, and monitoring of impacts from land use such as farming, mines, landfills, and quarries.

51. Collaborative management of aquifers is as important as river basin management, especially in regions where water supplies are becoming increasingly variable due to climate change. A comprehensive approach to aquifer management should include not only protection and monitoring but also joint efforts among all stakeholders to address and mitigate the negative externalities associated with extensive groundwater use.

52. Municipalities and regions should support the formation and operation of river basin management committees, ensuring they receive adequate political and staffing support. The work of these committees should be viewed as a continuous process at building trust, sharing objectives, and fostering long-term stakeholder engagement within the watershed or aquifer. While collaboration can resolve many issues, municipalities and regions should also be prepared to address and explain possible failures such as floods, wildfires, or droughts, that may occur despite best efforts.

d) Improving cooperation between cities and their rural surroundings

53. Building on collaborative efforts, municipalities and regions should lead in establishing smart water management practices tailored to their specific contexts. This involves negotiating and agreeing upon principles with stakeholders to ensure mutual objectives for water use and allocation are clear. These principles should be regularly reviewed, with tools like the Water Exploitation Index (WEI+) updated annually to monitor progress.

54. Municipalities and regions can also champion the digitalisation of water data, fostering an environment where river basin and aquifer statuses are openly shared. Creating a Water Information Platform (WIP) would enable stakeholders to access and utilise data for research, decision-making, and community engagement. Such platforms should be supported by expert interpretation to ensure data usability for all, including educational and citizen science initiatives.

55. Following World Health Organisation (WHO) recommendations, dynamic water safety planning should be implemented to integrate municipal and regional efforts with broader stakeholder involvement. The Integrated Water Resources Management (IWRM) tool and the Food-Water-Energy Nexus concept are valuable for demonstrating how different uses of water resources impact one another and fostering a shared understanding among all users, crucial for ensuring sustainable supplies of food, water, and energy.

³¹ EurEau, "The Value of Waste Water Services", July 2022; "The Value of Water Services", May 2021.

56. Highlighting the value of ecosystem and geosystem services through a well-maintained WIP can facilitate the economic valuation of these services. Practical applications, such as compensating farmers for using their land to mitigate flooding or implementing nature-based solutions to reduce nutrient leaching and soil erosion, should be linked to climate forecasting and economic models to demonstrate their benefits and viability.

57. A healthy landscape, where water flows are integrated into various ecosystems such as wetlands, forests, and farmlands, is essential for providing ecosystem services. These services, including carbon storage, drought and flood risk reduction, biodiversity support, and climate mitigation, depend on a fully functioning water cycle. Therefore, municipalities and regions must recognise the pivotal role of water in sustaining these landscape functions.

58. To achieve the 2030 Agenda and successfully meet all the Sustainable Development Goals (SDGs), landscape and water interactions play a pivotal role. A fully functioning and uninterrupted water cycle affects landscape productivity and climate resilience. If large areas of trees are cut down in one area, the water cycle risks being interrupted, disturbing ecosystem functions, and possibly causing a drought in another area down-wind. When tree cover is lost, the soil is at risk for erosion, and the water cycle may become hampered. The water simply floods the area and disappears back to the sea, leaving land dry and infertile.

59. If this development is not corrected, landscapes will degenerate to such an extent that they no longer can provide clean water, fibre, energy, food, and carbon storage that currently makes up the backbone of societies. The forest-water nexus must function fully to ensure the landscape is healthy.³²

60. Forests, and all types of tree cover, play a pivotal role in climate adaptation and mitigation. Tree roots infiltrate the ground, recharging groundwater and holding water within their soil, which helps to prepare for uncertain flow of floods and droughts. Trees sequester carbon from the atmosphere, storing it in their leaves, trunks, and roots. Trees are water consumers, but also water filters and reservoirs. These interactions are necessary to mitigate the effects of climate change and improve landscape resilience.

61. Healthy forests and trees are crucial for an intact water cycle. Although there are many forest restoration initiatives occurring all over the world, sometimes these plans do not include water flows sufficiently. For example, if the wrong species of tree is planted, or too many or too few trees are planted, this can threaten the survivability of the seedlings or trees. This can also have other negative effects such as reduced water flow downstream.

62. Within a landscape, many different species live and function together in a mosaic of different ecosystems. Within species there are genetic variations, with each variety potentially playing a crucial role in that ecosystem and improving species resilience. If one species is lost, another may not be able to take over its role, leaving a hole in the ecosystem. If many species are lost, there is increased risk of an ecosystem collapsing. A biologically diverse ecosystem includes all these variations, which means that if one variation declines another may take its place. When biodiversity is promoted in landscapes, nature is better protected against climate change.

63. In the past, landscapes and water have been viewed as two separate sectors, with water often considered only in terms of its utility for drinking, heating, cooling, or industrial processes. However, landscapes and water work together to provide crucial ecosystem services, such as climate regulation, nutrient cycling, pollination and temperature moderation. An integrated, cross-sectoral approach to landscape planning that includes water is essential for ensuring long term resilience and effectiveness in climate adaptation.

64. In the framework of a circular economy, municipalities and regions can develop partnerships to recycle water and reuse waste products. For example, the agricultural sector could use treated wastewater and sludge nutrients, while excess heat from industrial cooling water might be repurposed for district heating or utilised in other industrial processes. These partnerships should extend across various sectors and scales, enhancing resource efficiency and sustainability throughout water basins.

³² Forest Research, "[Sustainable urban drainage systems \(SUDS\)](#)".

65. Using digital technologies for real-time monitoring and modelling enhances the management of water quality and flow, promoting greater stakeholder engagement through increased transparency. This approach enables more effective responses to issues like drought and flooding and facilitates broader stakeholder input into addressing water pollution and over-abstraction, thereby offering a more comprehensive view of water system statuses.

5. OPERATIONAL AND TECHNOLOGICAL INNOVATIONS IN WATER MANAGEMENT

a) Improving the allocation and (re-)use of water

66. Water resources must be shared rationally and equitably among users. Resource use can be optimised in various ways, including water reuse and, where appropriate, rainwater harvesting, as highlighted under “Circular water” in Figure 1. Treating wastewater to a safe and good quality enables enhanced water reuse; not all water needs to meet drinking water standards. The EU has set minimum targets for the reuse of treated wastewater for irrigation in agriculture, advocating for more water recycling supported by policy development.³³ Embracing water recycling significantly increases the available water resource.

67. A variety of water sources including groundwater, surface water, rainwater, brackish water, brine, grey water, black water, and recycled water, all play roles in a dynamic water budget. It is crucial that water use is secure, resilient, and sustainable, with a focus on keeping the Water Exploitation Index (WEI+) low. Regular updates to the WEI+ status assist municipal and regional decision-makers and other stakeholders in adapting to smart water use. Key performance indicators for freshwater use should be analysed, with goals set to decrease the WEI+. An annual evaluation of the WEI+ can aid municipalities and regions in enhancing smart water use and communicating the status of freshwater resources and potential changes in water use to all partners involved.

68. Municipalities generally own and operate public water and sanitation systems. As responsible asset managers, they ensure that fees and tariffs charged to water consumers cover both operational and capital costs, including reinvestments to maintain the safety and resilience of the infrastructure, as depicted under “Resilient water” in Figure 1. A significant portion of all drinking water in Europe is lost to leaks from distribution systems. Routine maintenance of pipes can substantially reduce these leaks. Moreover, the collection and treatment of municipal wastewater facilitates the further use of this resource once it is returned to the environment, promoting a circular water use approach.

b) Adopting digital and artificial intelligence-based solutions

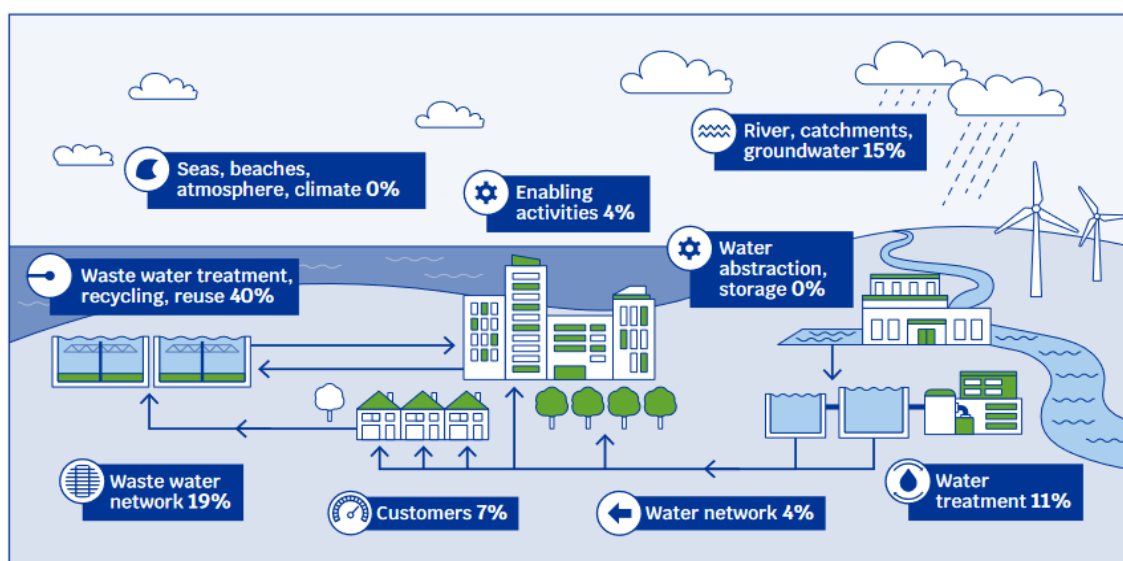
69. Innovation is pivotal for improving suboptimal practices at all levels of water management, encompassing both product-level and system-level advancements. System-level innovations take a broader approach and can significantly transform water practices. Public procurements, which often involve substantial investments, can be strategically directed to stimulate innovative solutions for complex water-related problems, fostering what is known as innovation procurements. Moreover, since the public water sector often operates on a non-profit basis, it is uniquely positioned to share knowledge and expertise widely, accelerating the dissemination and adoption of new technologies across different regions.

70. While technical innovations are rapidly spreading across Europe, their full potential has yet to be fully realised. Municipalities and regions should be empowered with more competencies and opportunities to explore and adopt technologies that best suit their specific contexts. Regulatory frameworks and economic instruments should avoid locking cities and regions into sub-optimal technological trends, instead encouraging customised solutions that meet clear goals. Technological innovations in water management include smart water metering systems, advanced water recycling technologies, and rainwater harvesting techniques. Additionally, infrastructural innovations such as green roofs, permeable pavements, and constructed wetlands not only enhance water absorption but also help reduce flooding and decrease pollution. These measures are crucial for mitigating water shortages and increasing groundwater recharge. To optimise these technologies, planners and basin managers should actively engage with and learn from best practices implemented across different basins.

³³ European Parliament and the Council, Regulation (EU) 2020/741 [on minimum requirements for water reuse](#), 25 May 2020.

71. Several European countries have on a governmental level identified the need for innovation in the water sector. Two recent examples are Ofwat and Water Wise Society. Ofwat, the Water Services Regulation Authority for England and Wales established the Water Innovation Fund in 2020.³⁴ Ofwat is a non-ministerial government department established in 1989, when the water and sewerage industry in England and Wales was privatised. In 2020, Ofwat launched the £200 million Ofwat Innovation Fund (“the Fund”) to grow the water sector’s capacity to innovate to better meet the evolving needs of customers, society, and the environment. Through a series of innovation competitions, the Fund aims to unleash a wave of innovation in the water sector with the aim to deliver value for all customers and to see companies sharing learning to ensure these benefits spread throughout England and Wales. As of July 2024, Ofwat have run six competitions including the Innovation in Water Challenge, four rounds of the Water Breakthrough Challenge; and the Water Discovery Challenge. In total, over £146 million has been awarded to water company-led innovations during 2020-2024. Figure 2 presents an overview of the funded projects for 2023-2024.

Breakdown of winning projects in 2023/24 within the water cycle*



*Includes Water Discovery Challenge finalists

Figure 2. Ofwat presentation of the innovation projects funded in 2023-2024.

72. In Sweden, three governmental agencies Formas, Vinnova and the Swedish Energy Agency, have reserved around SEK 100M (around €9.5 M) per year for up to 10 years to the programme initiative Water Wise Society – sustainable water for all by 2050³⁵. The program will bring about a system change for the management of water resources and related infrastructure. The goal is a future where water is available in the right quantity and quality despite a changing climate. It is led by the research institute RISE in collaboration with IVL Swedish Environmental Research Institute, Linköping Science Park, Lund University, Stockholm Environment Institute and the Swedish water and wastewater association (Svenskt Vatten). The levels of support for the initiatives will depend on the type of initiative and the stakeholder(s) involved and may be higher than for the programme offices.

6. CONCLUSIONS

73. The value of water needs to be highlighted in society, shaped by policies focused on water resilience, sustainability, and security. Recognising these values is essential for addressing the myriad challenges in water management, and demands good water governance.

74. In recent years, municipalities and regions across Europe have faced increasing challenges in managing water resources. These resources and their related ecosystems are under growing pressure, often characterised by issues of having too little, too much, or too polluted water. Without significant changes in water governance, these problems are likely to escalate.

³⁴ Ofwat Innovation Fund, [Annual report 2024, July 2024](#).

³⁵ Impact Innovation, [Programmes, March 2024](#).

75. The role of local and regional authorities is pivotal in managing water resources effectively. Their responsibilities include providing access to drinking water and sanitation, preserving ecosystems and biodiversity, planning land use and steering and supporting innovation. They should use public procurement strategically to promote smart water use. Local and regional authorities are essential for addressing both current and future water-related challenges, with their efforts optimally coordinated through collaborative actions within river basins and aquifers.

76. This report encourages local and regional authorities to adopt strategic approaches to water governance. It emphasises the need for urban and regional water policies to be human-rights oriented and responsive to both current and future challenges. Furthermore, it presents a toolbox for implementing effective water governance locally. Although municipalities and regional governments cannot tackle these challenges alone, a variety of policies and techniques have been successfully applied across Europe for decades.

77. Effective water governance requires the careful and respectful inclusion of all stakeholders in the decision-making process. Where such policies are reliably implemented, they lead to continuous improvements in water quality, increased biodiversity and equitable distribution of water resources, benefiting society as a whole.

78. Water governance is not a project, but a process which needs to be supported and protected politically at least for the coming decades to have sufficient time to achieve a change in how water is used in society. European and governmental support is needed and can be achieved, but the vast part of the changes must be made under the political leadership of municipalities and regions.

APPENDIX: CASE STUDIES OF BEST PRACTICES

79. In an effort to highlight diverse and effective approaches to water management, several examples will be selected from regions with distinct geographical, climatic, and socio-economic characteristics. These examples demonstrate innovative solutions from Western Europe (the Netherlands and Belgium), Southern Europe (Portugal), Eastern Europe (the Republic of Moldova), and Northern Europe (Finland and Sweden). Each region presents unique challenges and solutions in water management, demonstrating localised responses to global issues like water scarcity, flooding, and sustainable agricultural practices. These cases will not only reflect their respective regional priorities but also offer insights into the integration of advanced technologies, community involvement, and strategic policy implementations.

REPUBLIC OF MOLDOVA

The formation of Nirnova River Basin Intercommunal Development Association in the Republic of Moldova

80. In close cooperation with Water Solidarity Europe and International Secretariat for Water (SIE-SEE)³⁶ and with support from The EU4Environment Water and Data programme and the EU Water Initiative Plus project, 30 municipalities in Hincesti and Nisporeni districts in the central western part of Moldavia were able to form the Intercommunal Development Association "Nirnova River Basin" (ADI), in September 2023³⁷. The group of municipalities was established in accordance with the Law No. 17 of 02.02.2023 on Intercommunal Development Associations of the Republic of Moldova. This is the first form of Moldovan inter-municipal cooperations, whose objective is to strengthen convergence and pooling of resources to improve the services provided to residents, starting with access to drinking water and sanitation.

81. The ADI is part of the reform process initiated by Moldova on its path to European Union integration. The member municipalities are committed to jointly establishing water resource management in accordance with the principles of Integrated Water Resource Management (IWRM), where water is a limited and vulnerable resource essential for sustaining life, the environment and development.

82. The first meeting of the ADI was held on 16 January 2024. The meeting was attended by the Ministries of Environment, of Infrastructure and Regional Development of the Republic of Moldova, by Water Solidarity Europe and International Secretariat for Water (SIE-SEE), representative of the Moldovan Parliament, French Embassy in the Republic of Moldova, Apele Moldovei Water Agency, Artois Picardie Water Agency from France, Presidents of Hincesti and Nisporeni districts and mayors of municipalities located in Nisporeni and Hincesti districts.

83. The meeting focused on the future procedural work of the ADI: election of the ADI President, creation of thematic working groups. In the afternoon, participants discussed the action plan for water and sanitation.

84. Since the Republic of Moldova gained the status of candidate country for European Union membership in June 2022, its government has increased efforts to reform the country's public administration sector - including at the local level. SIE-SEE has been present in Moldova since 2006, carrying out several projects such as mobilisation actions for civil society, particularly young people, as well as one-off interventions on water and sanitation facilities. Its action began with the organisation of a European Youth Parliament for Water and the construction of eco-sanitary toilets in schools in three rural municipalities.

85. The objectives of this reform are fully in line with SIE-SEE's recommendations, which include the removal of legislative obstacles that prevent mayors and municipal authorities from jointly exercising their powers related to water management. Drawing on the basin's mayors association, ADI can serve as a pilot program in Moldova and will be "replicable" for other basins in its approach and methods.

36 See [International Secretariat for Water \(ISW\) and Solidarity Water Europe \(SWE\)](#).

37 EU4Environment, Water and Data in Eastern Partner Countries, "[The Nirnova Basin Intercommunal Development Association \(ADI\) in Moldova meets for the first time to advance on water supply and sanitation](#)", 17 January 2024.

It will also aim to inspire water policies in Moldova through an iterative approach between the State's definition of water policy and the concrete implementation by elected officials in the Nirnova basin. ADI is thus a local, multi-stakeholder and long-term collaboration aiming to build partnerships and involve local community actors to improve access to drinking water and sanitation in the basin.

THE NETHERLANDS

86. Several local and regional projects have been successfully implemented in the Netherlands to minimise flood risks. The Netherlands' name reflects its low-lying geographical position. It is a downstream country for major European rivers. A notable project involves the Waal River, which makes a sharp bend and narrows near Nijmegen, creating a bottleneck.³⁸ By moving the dike at Lent 350 metres inland, room is created for a bypass channel which drains the water during extremely high-water levels. This feature has been constructed 2012-2016 and offers better flood protection near Nijmegen.

87. The centerpiece of this flood management initiative is the River Park in Nijmegen, designed to align with the river's natural flow and sedimentation patterns, as well as accommodating regular tides. This urban river park is open to the public and thoughtfully incorporates archaeological and historical features into its design. It also serves a multifunctional purpose, providing a venue for events and exhibitions on its artificial island. The total investment for this project was approximately 351 million euros, primarily funded through the national budget. A cost-benefit analysis highlighted its economic efficiency, showing benefits of approximately 270 million euros from reduced flooding costs.

PORTUGAL

Algarve Regional Water Efficiency Plan

88. The Algarve Regional Water Efficiency Plan targets urban water loss reduction in South Portugal, supported by both EU and national funding.³⁹ This initiative aims to rehabilitate 125 km of distribution networks in several municipalities by 2026, reducing annual freshwater demand by 2 million cubic meters. The plan involves replacing and renovating old pipes and creating Measurement and Control Zones (ZMC's) and Pressure Measurement Zones (ZMP) to manage water flow more efficiently. The project is co-funded by the EU with a contribution of EUR 43.9 million, supplemented by local and national financing.

Challenges and Technological Advances in Portuguese Agriculture

89. Portugal faces increasing water shortages, exacerbated by its Mediterranean climate naturally including dry periods. This already arid climate is now intensified by frequent and prolonged droughts. Agriculture, particularly in Southern Portugal, is highly dependent on irrigation for crop productivity. While 65% of farmers have adopted drip irrigation systems, 71% still lack water meters.⁴⁰ This highlights the need for more innovation and a significant technological upgrade across the agricultural sector to enhance water management efficiency.

Adoption of AgriTech technologies and their impact

90. Approximately 30% of surveyed farmers use soil moisture probes, 27% utilise weather stations, and 37% employ irrigation control programs, which have helped reduce water usage by 20-50%. Moreover, these technologies have also led to reductions in energy consumption by 85% of the adopters, decreased fertilizer use by 66%, and time-savings for 77% of them through automated irrigation control.

38 Climate ADAPT, "Room for the River Waal – protecting the city of Nijmegen", Database, Case studies, last modified on 18 April 2024.

39 AMAL – Comunidade Intermunicipal do Algarve (in Portuguese only).

40 Calouste Gulbenkian Foundation, "Water footprint in Portugal", Lisbon 2020.

Water conservation tips from EPAL

91. Lisbon's water supply company, EPAL, offers practical advice to help consumers reduce their water use.⁴¹

- Ensure taps are fully turned off to avoid leaks;
- Opt for shorter, five-minute showers, using water only as needed;
- Turn off the tap while brushing teeth to significantly save water;
- Adjust toilet flush volumes and repair leaky cisterns promptly;
- Use dishwashers and washing machines only with full loads and select eco-friendly programs and detergents;
- Regular meter readings help avoid estimated bills and track actual water use;
- Install flow reducers on taps to cut down water consumption;
- Efficiently water gardens during cooler times of day and reuse household water for plants;
- Opt for ecological car wash stations and wash cars only when necessary.

FINLAND

92. Finland, despite its abundant lake resources and modest population size, launched a strategic initiative in 2018 called the Finnish Water Way – International Water Strategy.⁴² This strategy, which is designed to run until 2030, aims to ensure responsible and equitable water security through a Finnish model of sustainable water management, characterised by extensive cross-sectoral collaboration. The government has allocated approximately €108 million to this strategy for the period from 2018 to 2030. A Special Envoy for Water has been appointed, coordinating across multiple ministries. The strategy is structured around three principal focus areas, each encompassing specific measures aimed at enhancing water management:

I. Water for Sustainable Development

1. Nature-based solutions
2. Circular economy solutions
3. Improving the sustainability of water resource use
4. Risk management and prevention
5. Spatial planning
6. Water stewardship commitments and partnerships

II. Water for People

1. Risk management and precautionary measures in water supply
2. Increasing awareness of efficient water use
3. Designing, developing, and managing infrastructure
4. Safe circular economy solutions in water supply
5. Industrial circular economy solutions and closed solutions
6. Nature-based solutions in waste and urban runoff treatment
7. Dry sanitation solutions
8. Solutions for situations related to a crisis and reconstruction

III. Water for Peace

1. Promoting integrated water resource management (e.g. planning, protection) at all levels
2. Preventing water-related hybrid threats and providing technological solutions to guarantee security
3. Promoting transboundary water conventions at all levels
4. Preventive water diplomacy in multi-track peace mediation
5. Developing the coordination and management of water security globally.

⁴¹ EPAL – Grupo Águas de Portugal, Efficient use, "Conscious water use - use well, save water and carbon emissions for a more sustainable planet".

⁴² Ministry of Agriculture and Forestry, Ministry of Economic Affairs and Employment, Ministry of Environment, Ministry of Foreign Affairs, Ministry of Social Affairs and Health, "International Water Strategy Finland – Finnish Water Way", Helsinki, August 2018.

SWEDEN

93. Sweden, known for its approximately 125 major river basins, exhibits diverse levels of engagement from municipalities and stakeholders regarding these water sources. About 50% of the nation's drinking water supply comes from surface water, with a significant portion of agricultural irrigation depending on water from lakes and rivers. A standout example of effective river basin management is the River Basin Council of the River Kävlingeån, Kävlingeåns Vattenråd.⁴³ Since the 1950s, this River Basin Council has spearheaded collaborative municipal projects, including the restoration of 360 hectares of wetlands and ponds within its 1200 km² basin. In 2024, it introduced a comprehensive water plan focusing on conservation measures designed to maintain and improve the water's ecological status. These efforts include creating wetlands, ponds, re-meandering watercourses, and establishing various protection and management zones to enhance biodiversity and reduce flood risks.

94. The council's strategy extends beyond physical interventions. It incorporates continuous environmental monitoring and targeted surveys to identify priority areas that are significantly impacted by agricultural activities or are crucial for groundwater recharge. The plan also involves developing a detailed hydrological model to manage water flow more effectively, preventing floods and ensuring sufficient water reserves for dry periods. Notably, 78% of the basin area comprises active agricultural land, which underscores the importance of managing agricultural runoff and other rural impacts on water quality.

95. Furthermore, the council supports the adoption of innovative agricultural techniques that enhance soil structure, nutrient use, and water retention. Initiatives include promoting pilot areas for experimental farming practices and facilitating local water dialogues to foster community engagement and awareness. These dialogues aim to encourage practical actions that align with sustainable water use and conservation goals.

96. The River Basin Council also focuses on strengthening the link between urban and rural water management. It aims to improve collaboration through regular meetings and educational activities that highlight the importance of water conservation in all aspects of planning and development. The council acts as a coordinating body, ensuring that water-related considerations are integrated across various municipal departments and sectors.

97. The Kävlingeåns Vattenråd exemplifies a multifaceted approach to water management that combines technical, environmental, and community-driven strategies. Its efforts are crucial in maintaining the health of the river basin's ecosystems and supporting the region's agricultural needs, ultimately contributing to Sweden's broader environmental and water management objectives.

43 See [Kävlingeåns vattenråd](#)