Meeting of the Parties to the Protocol on Water and Health to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes

Working Group on Water and Health

Thirteenth meeting
Geneva, 19 and 20 May 2022
Item 9 of the provisional agenda
Safe and efficient management of water supply and sanitation systems

INFORMAL DOCUMENT

Sanitation policy brief

(draft publication)

Safe management of the sanitation service chain is essential for protecting human health and water resources. Sustainable Development Goal targets 6.2 and 6.3 set out a clear agenda and call for adequate and equitable sanitation for all, halving the proportion of untreated wastewater and substantially increasing safe reuse. The programme area on Safe and efficient management of water supply and sanitation systems prioritizes attention towards advancing the policy agenda on improving sanitation in the pan-European region. The development of a policy brief is one of the activities planned under the programme of work for the period 2020-2022.

A draft of the policy brief provides an overview of situation on sanitation and wastewater management; the burden of water and sanitation-related disease and its surveillance; current and emerging challenges related to ensuring safe and sustainable sanitation services in the pan-European region from policy, institutional, technology and financial perspectives and proposes key actions by national and local decision-makers to strengthen sanitation governance. The draft document also intends to inform future directions and priorities of work under the Protocol on Water and Health.

The lead-Parties, in cooperation with the Joint Secretariat, plan to organize a dedicated (virtual) expert consultation on 24 June 2022 with the aim of discussing the draft policy brief in the context of the challenges and strategic directions in the field of sanitation in the Parties and other States in the pan-European region. The outcomes of the meeting will be reflected in the final version of the policy brief.

The Working Group on Water and Health is requested to review the current draft document and provide comments and feedback to Oliver Schmoll (schmollo@who.int) by **10 June 2022**.

Note: The draft document is for review by the Working Group on Water and Health only and not for wider distribution at this stage.

1. INTRODUCTION TO THE SANITATION SITUATION IN THE PAN-EUROPEAN REGION

Access to sanitation

Access to sanitation is recognized as a basic human right, along with the human right to safe drinking water. Safely managed sanitation is essential for health, environmental protection, and economic development worldwide. A safe sanitation system is designed to separate human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment, and final disposal or end-use. [1] SDG 6.2 stipulates that all populations should have access to safely managed services, i.e., each household must have access to improved facilities and associated waste transport and treatment services (including in situ), as well as handwashing facilities on-premises (Fig 1). Achieving SDG 6.2 can help support progress on other aspects of the 2030 Agenda for Sustainable Development through generating social, health, economic, and environmental benefits, including human health through safe Water, Sanitation, and Hygiene (WASH) in Health Care Facilities and schools (SDG 3 and 4), sustainable consumption and production through the circular economy (SDG 12), and others. In addition to SDGs, the Protocol on Water and Health, a unique legally-binding instrument linking sustainable management of water and sanitation services and prevention and control of water-borne diseases, provides sanitation targets for the member countries of the region and follows up with reporting and analysis of regional trends on sanitation. [2]

SERVICE LEVEL	DEFINITION
SAFELY MANAGED	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated off-site
BASIC	Use of improved facilities that are not shared with other households
LIMITED	Use of improved facilities that are shared with other households
UNIMPROVED	Use of pit latrines without a slab or platform, hanging latrines or bucket latrines
OPEN DEFECATION	Disposal of human faeces in fields, forests, bushes, open bodies of water, beaches or other open places, or with solid waste

Fig 1: SDG ladder for sanitation systems and services

Note: Improved facilities include: pour/flush toilets connected to piped sewer systems, septic tanks or pit latrines; pit latrines with slabs, and composting toilets

Despite significant progress in extending WASH services in recent years, access to safely managed sanitation services has not been achieved for all in the pan-European region (Fig 2). Between 2015 and 2020, access to safely managed sanitation has increased by 4% in Eastern Europe and Southern Europe whereas the 3% access was increased in Northern Europe and Western Asia. There were missing data from countries in Central Asia on access to safely managed sanitation. The progress towards universal access to safely managed sanitation has

been plodding globally and may require up to quadrupling current rates to achieve SDG sanitation targets by 2030.[3]

In the pan-European region, about 97% of the population has access to at least basic sanitation, but only 77% of the population has access to safely managed sanitation. Large inequalities in access exist across different parts of the region. The 2021 Joint Monitoring Program (JMP) reports that 95% of the population has access to safely managed sanitation in Western European countries. In contrast, the access is limited to 80% in Northern Europe, 79% in Eastern Europe, 73% in Southern Europe, and around 71% in Western Asia. All sanitation access and wastewater treatment data are taken from the 2021 JMP database.

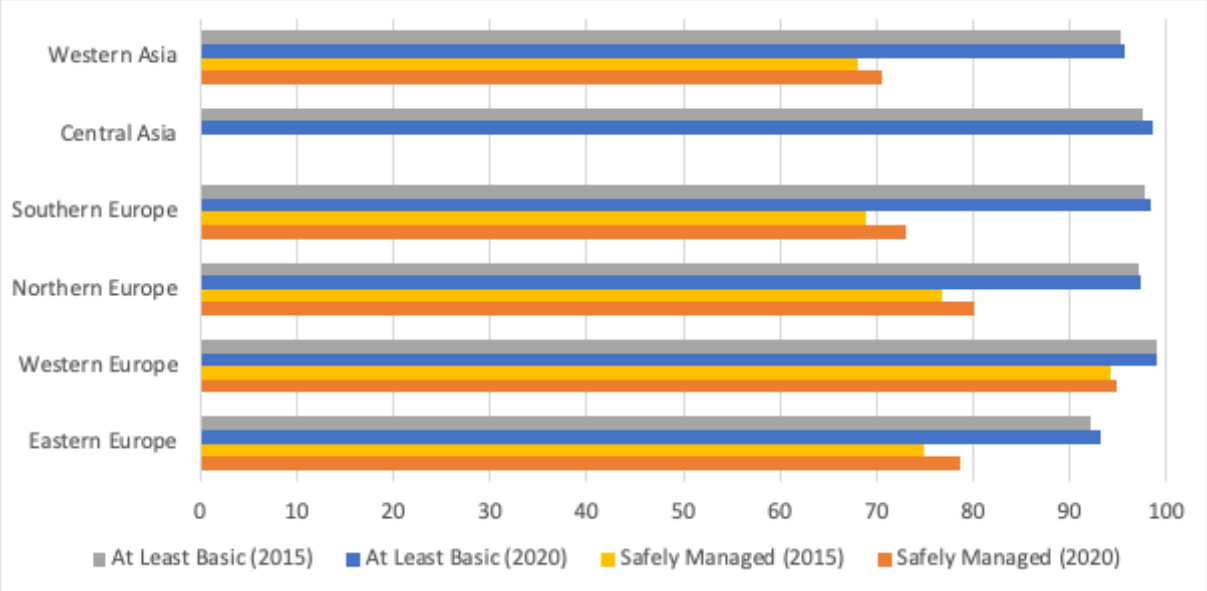

Fig. 2: Regional Sanitation Coverage in the pan-European region between 2015 and 2020

Inequalities also exist between rural and urban settings within countries. For example, about 98% of the population in urban Western Asia have access to at least basic sanitation, whereas the access is limited to 90% in rural settings. A similar contrast was also observed for countries in Eastern Europe and Western Europe with differences in access to at least basic sanitation between urban and rural settings was 13% and 12% respectively. It is important to note that such disparity in access to sanitation between urban and rural settings is not as prominent (<3%) in Northern Europe, Southern Europe, and Central Asia.

Access to sanitation, mainly safely managed sanitation, also depends on the wealth index in Eastern European, Central, and Western Asian countries. For example, around 88% of the wealthiest people in Albania have sewer connections, whereas only about 13% of the poorest people have access to such connections. Similarly, in Bosnia and Herzegovina, 70% of the richest have a sewer connection, whereas only around 30% of the broader population have such access.

Institutional sanitation, schools, and health care facilities (HCFs), also need attention in the region. In 2019, 7 million kids lacked access to basic sanitation facilities in the region. Similarly, lower coverage of basic sanitation was also reported in HCFs although there were major data gaps for sanitation access in HCFs in the region. The marginalized population in the region also has limited access to sanitation systems and services. For example, Roma in Western Balkans has limited to no access to basic sanitation services, and significant gaps in

sanitation systems and services are seen between Roma and non-Roma in several Balkan countries. [4] These existing inequalities in access to sanitation are alarming, and appropriate action is urgently required.

Wastewater collection and treatment

In the pan-European region, 71% of the total population was connected to centralized sewer systems in 2020. However, there are significant differences across the region in terms of sewer connections. About 95% of the population in Western Europe and 84% of Northern Europe have a sewer connection. In contrast, the numbers are limited to 79% in Southern Europe, 75% in Western Asia, 68% in Eastern Europe, and only 25% in Central Asia. Between 2015 and 2020, there was a 4% increase in sewer connection throughout the pan-European region. In terms of treatment, about 57% of the overall wastewater is treated, which receives at least secondary (biological) treatment, in the pan-European region. More than 90% of the wastewater is treated in Western Europe, whereas only around 72% in Northern Europe and 55% in Eastern and Southern Europe. Only 45% of wastewater is treated in Western Asia and 25% in Central Asia (Fig 3).

About 81% urban population of the region is connected to sewers compared to 44% of the rural population. Stark differences are seen in countries in Eastern Europe with 85% sewer connection in urban areas compared to 34% in rural. Similarly, about 54% of the urban population in Central Asia has sewered connections whereas only 2% in rural areas have it. People living in these settings rely on non-sewered sanitation services, such as improved latrines and septic tanks (Fig 2). In addition to access, inequalities are also seen in types of sanitation facilities and wastewater treatment in the region and would require appropriate action plans to reduce the sanitation gap between urban and rural in the region.

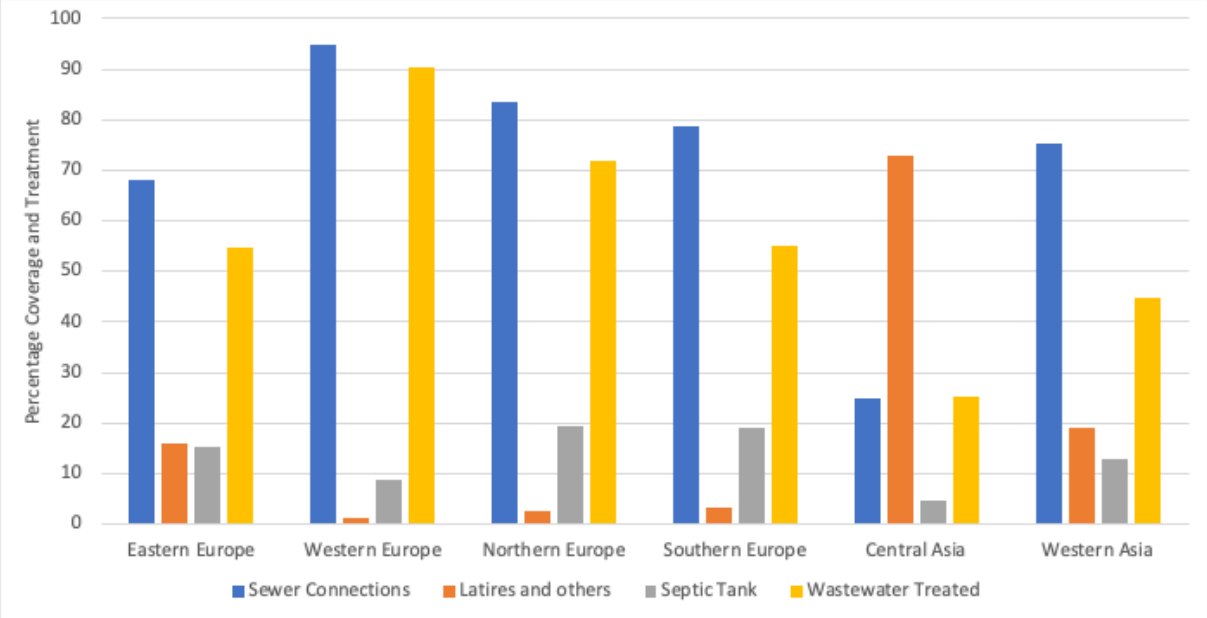

Fig. 3: Portion of the population using improved sanitation facilities, including wastewater treated

Wastewater management and reuse

SDG 6.4 specifies not only halving the proportion of untreated wastewater by 2030, but also "substantially increase recycling and safe reuse of wastewater" – an urgent priority as freshwater resources become increasingly scarce. Wastewater reuse opens access to new

sources of water, nutrients, and energy. The most common applications for wastewater reuse are agricultural irrigation, landscape irrigation, and industrial processes.

The extent to which wastewater reuse is practiced in the region varies a lot. About 1 billion cubic meters of treated urban wastewater are reused annually, mostly for agricultural irrigation, in the European Union, 2.4% of the total treated urban wastewater effluents. [5] Some countries like Cyprus and Malta reuse more than 89% and 60% of their treated wastewater are being reused respectively. In other countries, like Greece, Italy, and Spain reuse between 5% and 12% of their effluents. [6]

Sporadic data show that wastewater reuse is less than 1% in some countries in Eastern Europe, Central and Western Asia, and Turkey. [6, 7] Overall, there is a major data gap for wastewater reuse in Eastern Europe, Central and Western Asian countries. These data gaps can significantly hinder policy advocacy and action that address wastewater reuse in the region.

Box 1: Wastewater Reuse Policy for Agricultural Use in the Russian Federation: On January 28, 2021, the Russian Federation approved a decree for wastewater reuse for agricultural purposes. The decree explicitly states the use of wastewater for irrigation purposes if it meets the microbiological and parasitical indicators/requirements set by the state. In addition, specific requirements were also developed for the use of sewage sludge as fertilizer. [8] These national-level policy initiatives create an enabling environment for local-level policy advocacy and provide a clear pathway for persuasion for municipal treatment plans. The new regulation on minimum requirements for water reuse for agricultural irrigation has also entered into force for European Union (EU) region starting June 2023 that sets out regulations on harmonized minimum water quality and monitoring requirements, risk management provision, and permitting requirements. [9]

2. DISEASE BURDEN AND SURVEILLANCE IN THE PAN-EUROPEAN REGION

Insufficient sanitation and excreta management may lead to the presence of human waste in the environment. This may increase exposure to fecal pathogens and can lead to fecal-oral infections, including diarrhea, dysentery, typhoid, hepatitis A, and soil-transmitted helminth (STH) infections. Pathogens are spread from the feces of the agent into one or more environmental reservoirs (typically fields, finders, fluids, flies, food, and sometimes fomites) through human/animal interaction with the environment and/or natural processes. Subsequent interaction by susceptible people can result in infection (Fig 4). [10] Approximately seven daily deaths are attributed to inadequate WASH in low-and middle-income countries in the pan-European region. [11] A strong focus should be on designing interventions that reduce the cases of sanitation-related diseases in the region.

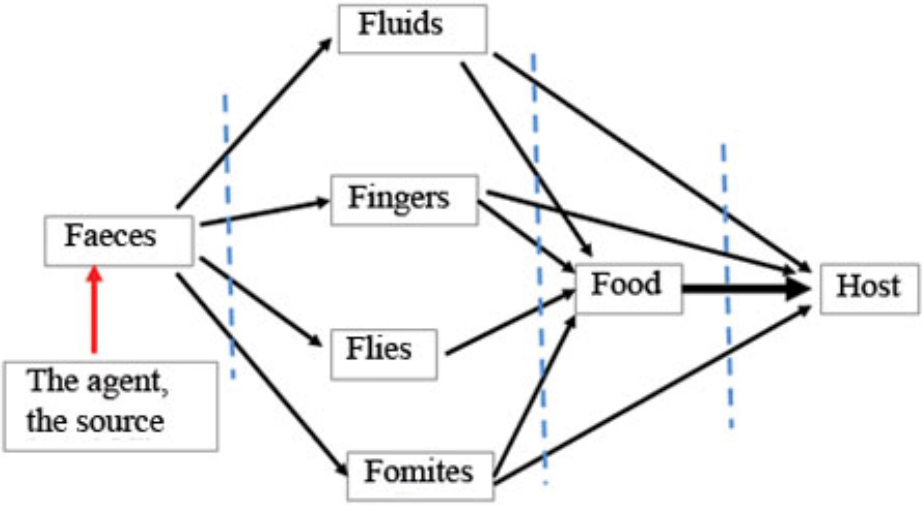

Fig 4: F-diagram, a conceptual model of potential transmission pathways of diarrheal diseases through environmental reservoirs. Adapted from open.edu

Between 2010 and 2021, based on Global Infectious Disease and Epidemiology Network (GIDEON), there were 483 reported outbreaks for diseases associated with poor water quality and inadequate sanitation in the pan-European region. Out of all the reported outbreaks, approximately 47% were in Northern Europe, 21% in Western Europe, 17% in Southern Europe, 11% in Eastern Europe, 4% in Western Asia, and 1% in Central Asia (Fig 5). There is an issue of underreporting the outbreaks in the region, primarily due to weak disease surveillance systems and limited lab capacities. To understand the true extent of water and sanitation-related disease outbreaks, appropriate surveillance and reporting mechanisms must be put in place. It is, therefore, essential to embed water and sanitation-related disease surveillance within national, regional, and local levels in every country, particularly in Eastern Europe, Western and Central Asia as the reported outbreaks were the least in the region. Such holistic monitoring is only possible with solid coordination between relevant stakeholders, water service providers, regulators, and environmental agencies.

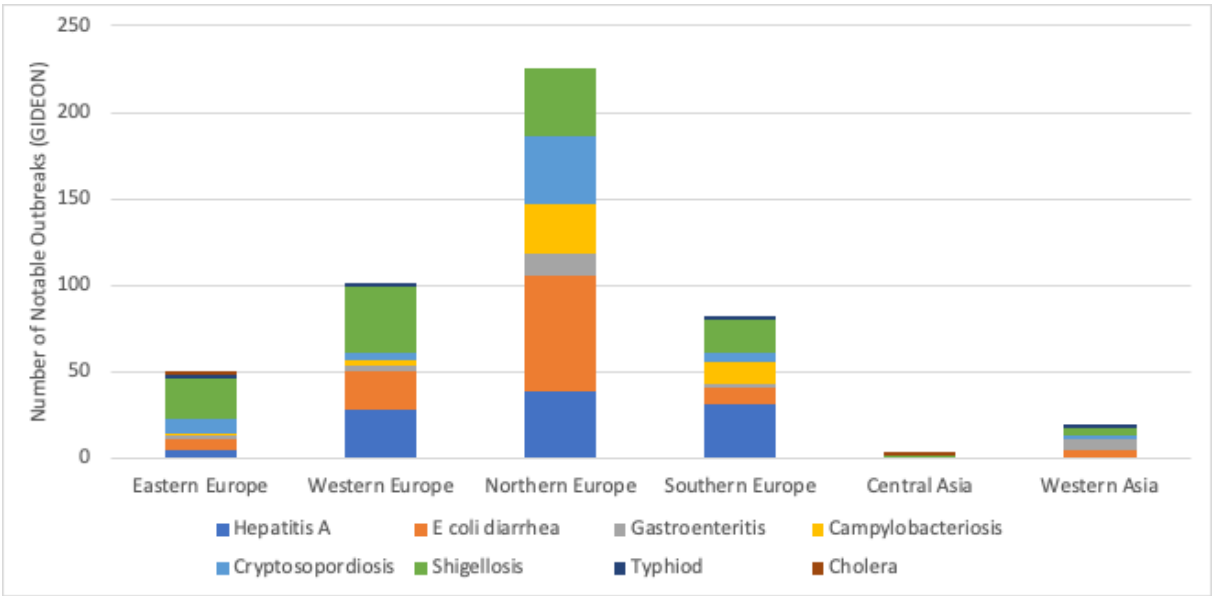

Fig. 5: Summary of potential water and sanitation-related outbreaks recorded in GIDEON between 2010 and 2021 in the pan-European region

Robust water and sanitation-related disease surveillance systems should engage stakeholders and identify their roles and clearly characterize public health problems in a particular setting. An established disease surveillance system is particularly critical during extreme events like floods, landslides, with heightened risks of water and sanitation-related diseases outbreak. Article 8 of Water and Health Protocol emphasizes on response system comprising comprehensive national/local surveillance and early warning systems along with contingency plans for the response for outbreaks.

Wastewater Based Epidemiology (WBE), a surveillance tool that involves regular testing of wastewater to evaluate the presence and concentration of pathogens is being successfully used for disease surveillance of Hepatitis A, Hepatitis E, Norovirus, Rotavirus, and Poliovirus. [12-15] Recently, it has also been widely been used to investigate severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) globally and in the pan-European region. Environmental surveillance of SARS-CoV-2 can provide early warning of community transmission, prompting local authorities to extend clinical testing and case finding. It can also provide information about disease circulation trends, including identifying hot spots in the cities or communities. Scaling up environmental surveillance, especially WBE, at the national level would require additional investments for laboratory and testing capacity and technical workforce to collect and analyze the wastewater samples. Countries with already strong disease surveillance mechanisms, especially in Western Europe and Northern Europe, should consider WBE at the local/national level to continuously monitor wastewater for the presence of waterborne pathogens.

Box 4: Outbreak surveillance in Finland: Municipal health protection authorities responsible for monitoring water quality must notify all suspected diarrheal disease cases to the National Institute for Health and Welfare (THL). This preliminary notification allows THL to gather information on the extent of the outbreak, symptoms of patients, the causative agent for the outbreak, management and remedial actions taken at the local level, and contact details of authorities in the location of the outbreak. The THL maintains the national task force coordinating with local authorities on technical, analytical, and epidemiolocal problems associated with water and sanitation-related diseases. After the adoption of the compulsory notification system, even the most minor outbreaks involving private wells were reported. Such robust disease surveillance systems are critical in identifying gaps in water and sanitation systems and services, enabling swift addressing of such issues.

Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) refers to the ability of microorganisms to withstand antimicrobial treatments. When microorganisms become more resistant to antibiotics, treatment can become ineffective posing a serious risk to public health. Wastewater and human excreta are significant sources of AMR bacteria and their genes because of the extensive use of antimicrobial agents. Most municipal treatment plants in the pan-European region do not treat microorganisms sufficiently, including AMR. As a result, they are directly released into the environment where AMR bacteria and genes can resist, and exposure to humans is possible.

AMR is responsible for an estimated 33,000 deaths per year in the EU alone. [16] Since AMR follows the same pathway as traditional microbial pathogens, safely managed sanitation can

also decrease the spread of resistant microorganisms. Although national AMR action plans exist in most countries, they do not address the role of WASH wastewater management in combating AMR. The Tricycle Protocol by WHO enables countries to implement National Integrated Surveillance System on antimicrobial resistance. [17] WASH strategies are crucial in all national action plans to address the issue of AMR in the region holistically, which mainly focus on potential hotspots of transmission, such as densely populated urban areas. This holds true especially for some countries in Eastern Europe, Central and Western Asia where poor surveillance systems exist for AMR in humans and are not enrolled in Global Antimicrobial Resistance and Use Surveillance System (GLASS).

In addition to traditional diarrheal diseases associated with water and sanitation and AMRs, soil-transmitted helminth (STH) is another significant challenge contributing to the disease burden in the pan-European region. STH, also called "intestinal worms", are primarily associated with poor excreta management and are transmitted through infectious fecal waste exposure. In particular in Central and Western Asia, more than 4 million children require preventive chemotherapy. [18] Several factors, including increased regional temperatures, bought about by rapid climate change, high rates of reinfection, and frequency of international travel are increasing STHs.

Chemical contaminants in sewage systems also contribute to disease burdens in the region. Micropollutants such as pharmaceuticals and endocrine disrupters are often discharged to surface water through untreated or partially treated wastewater. [19] Even conventional processes in treatment plants are not designed to remove micropollutants, which can persist in treated wastewater. These micropollutants can have an impact on human health as surface water is usually provided to drinking water treatment plants. Many micropollutants can withstand conventional water treatment systems and can be ingested. [19] Evidence also suggests that micropollutants have ecological implications on the aquatic environment [20] and thus need to be regulated. Although the removal efficiency of micropollutants depends on physiochemical characteristics of the micropollutant, advanced oxidation processes such as UV radiation, UV/ Cl_2, and UV/O_3 is promising technology to remove micropollutants in treatment plants.

3. EMERGING CHALLENGES IN SANITATION IN THE PAN-EUROPEAN REGION

Providing safely managed sanitation services to all will require substantial economic resources and strong political will. The COVID-19 pandemic has negatively impacted billions of lives and livelihoods, and the poor and vulnerable have been hit especially hard and have suffered their worst setback in years. The once-in-a-lifetime pandemic has highlighted the need for safely managed sanitation services in preventing disease and protecting human health, especially during outbreaks of infectious diseases. The COVID-19 pandemic and subsequent financial crises also have further exposed the inequalities and significant income disparities across regions, genders, ethnicities, and generations. Although there are several challenges in the sector, some most pressing emerging sanitation challenges in the region can be broadly divided into three major categories.

Negative effects of Climate change

Climate change has become one of the most significant global challenges, and it also possesses high risk and contributes novel issues to sanitation services. The negative effects of global climate change are contributing to an increased frequency and intensity of extreme weather events, including changes in precipitation and temperature patterns. Climate change-

induced heavy precipitation and flooding can cause untreated and less treated sewage to overflow into water bodies and surface waters, resulting in environmental pollution and can contribute to disease through recreational exposure or polluted drinking-water sources. In addition, heavy precipitation can also damage sanitation infrastructure and disrupt the regular operation and maintenance of treatment systems. Pit latrines and septic tanks can become unusable when filled with water and can force users to practice open defecation. Other impacts of climate change include drought, increased temperature, and sea-level rise, which stand to adversely impact sanitation systems and services. In addition, permafrost thawing can damage sanitation infrastructure including the bursting of sewage pipes and it can also lead to loss of reservoirs and flooding that raises the risk of sewage overflow. [21] An overview of negative climate-related effects on sanitation is shown in Fig. 6.

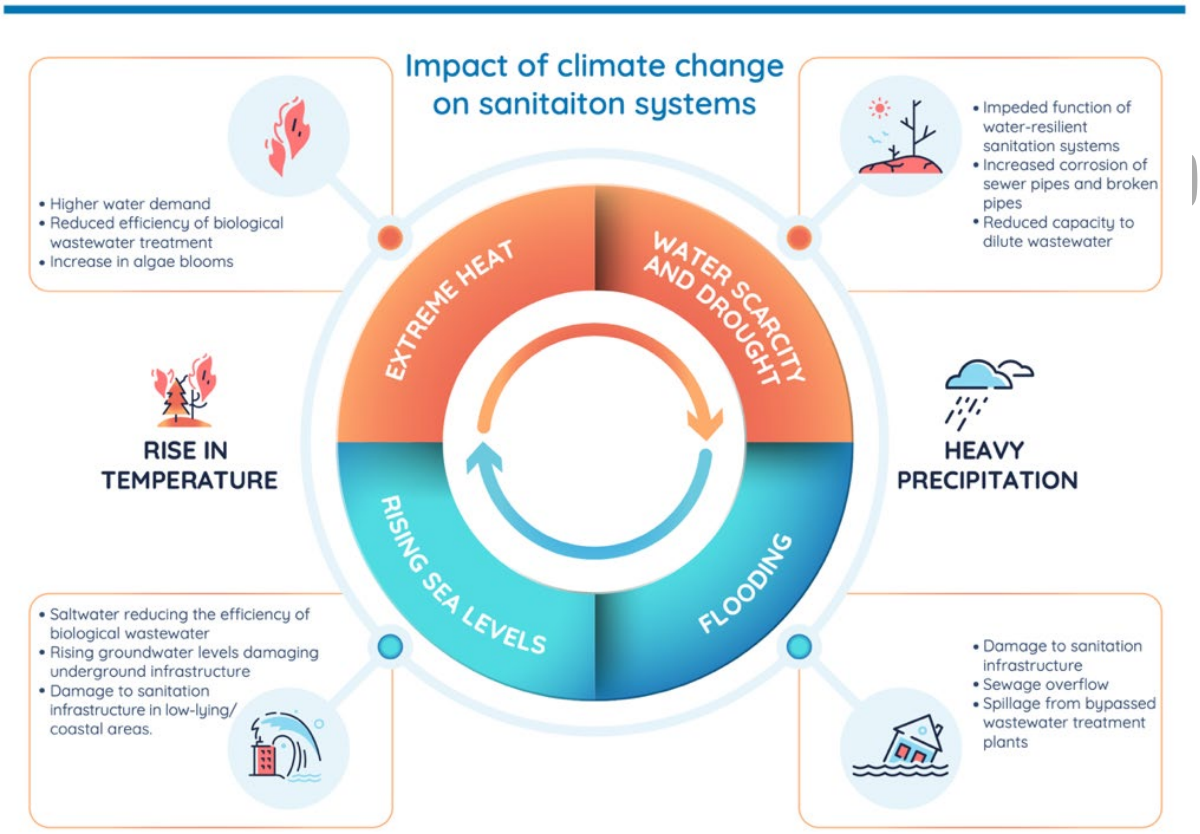

Fig 6: Negative impact of climate change on sanitation system and services

Box 5: 2021 Flooding Events in Germany: Flash flooding followed by heavy rainfall claimed the lives of more than 220 people and damages in billions in Germany, the Netherlands, and Belgium. Previous rainfall records were broken around Ahr and Erft rivers in Germany and Meuse in Belgium in 2021. Some towns in west Germany, like Ahrweiler, had no drinking water supply for days because of damaged drinking water treatment plants. After the destruction of wastewater treatment facilities, Ahr River and the Municipality, in coordination with the German Red Cross, deployed a temporary emergency modular activated sludge treatment plant. Similarly, in the district of Euskirchen, authorities advised residents to boil tap water before drinking as there was potential contamination with damaged sewers carrying wastewater. [22] Sewage overflow is one of the most common effects of flooding, which also increases the risk of diarrheal diseases. With the increasing frequency of extreme

weather events annually, all countries in the pan-European region should develop plans and policies to mitigate and adapt to these extreme events and improve resilience.

As natural disasters continue to disrupt and threaten people's lives and well-being in the pan-European region, not only does disaster planning needs to be a priority in national action plans, but sanitation should be a critical element of such adaptation and mitigation plans. Climate change requires rethinking the design and operation of sanitation systems to adapt to more frequent floods, droughts, and torrential rains. Each country within the region needs to consider the impact of extreme events and long-term changes induced by climate change on domestic scale-like pit latrines, conveyance scale-like sewers, and urban scale-like wastewater treatment plans and have plans for increasing resilience and adapting to climate change.

Risk mapping and subsequent interventions are essential in developing efficient climate-resilient sanitation systems. Risk mapping is a tool to identify the exposure to hazard and underlying vulnerability in the area of interest by including hazard and vulnerability indicators like projected changes in temperature, rainfall, runoff, access to sanitation, etc. Early risk mapping locations could enable responsible authorities to prioritize high-risk areas and, thus, plan and prioritize needed interventions. Interventions may include a range of approaches, from selecting flood resilient on-site technologies in rural settings to increase the capacity of traditional wastewater treatment plants in urban settings and sustainable urban planning.

Box 6: Lisbon Resilience Action Plan: The city of Lisbon has developed a Resilience Action Plan (RAP) to improve the resilience to climate change with a focus on water. Wastewater drainage and treatment and waste collection are considered in the plan to manage the risks during extreme weather events[23]. Urban drainage monitoring is done via installing flow rate meters, rain gauges, level meters, and sampling equipment in the city. They are also applying the Resilient Assessment Framework (RAF) for collective engagement and awareness, coordination and communication among stakeholders, city preparedness for disaster response, service and infrastructure preparedness, resilience engaged service delivery, strategic planning, and risk management. Strategies like these in cities and villages will aware stakeholders and citizens of the potential risk of climate-induced disasters and provide adequate time, resources, and human resources necessary in time of the disasters.

Ageing sanitation infrastructure

Ageing sanitation infrastructure is one of the main challenges for the pan-European region. The wastewater infrastructure throughout the region is rapidly ageing and needs to be repaired or replaced to provide adequate sanitation services. The renewal rate of infrastructure in the EU region is around 1% per year, which directly impacts the efficiency of the systems as the sanitation with leakages and deterioration of sewage systems. [24] 1% renewal rate indicates 100 years economic life of infrastructure this replacement rate is not sufficient to reverse the deterioration of the sanitation infrastructure that happens over time. Unanimously, European countries like Belarus, Estonia, Germany, Italy, Latvia, Lithuania, and the UK, consider ageing infrastructure a major challenge in their sanitation services. Sanitation infrastructure renewal requires large investments and high GDP expenditure. However, there is limited information on the national investment required for such changes.

Segments of EU's 7 million kilometers of pipes have been operating for over 100 years. Such ageing infrastructure results in deterioration in the quality of sanitation services as broken or blocked pipes can discharge untreated sewage in the open environment or local waterways, increasing risks of water-borne diseases and negative ecological effects. In addition, treatment plants designed post mid 20th century are not designed for nutrient removal, [25] especially in

countries in Central and Western Asia, and this issue can contribute to the eutrophication of local water bodies.

Demographics and human migration

A total of 80% of the region's population is expected to live in cities by 2030. [26] Rapid urbanization and population growth in cities and small towns in the region are increasing the pressure on sanitation service providers and access to safely managed sanitation services can be challenging. On the other hand, some sub-regions have seen their population shrink continuously over many decades. The movements are usually from rural regions to urban ones or to seek employment, in part to escape the relatively high poverty rate. This population shrinks in the region can also negatively impact the sanitation systems and services with the sewage stagnation, low flow, and foul smell in the locality.

In 2020 alone, more than 234,000 people were displaced because of natural disasters, and another 85,000 were displaced due to conflict and violence. [27] Storm and floods accounted for over half of a new disaster in the region (Fig 7). Uzbekistan, Croatia, Turkey, and Kazakhstan had the highest number of displacements due to disasters, with the number of people displaced totaling 70,000, 42,000, 41,000, and 32,000, respectively. Similarly, refugee and migrant crises are also on the rise in the region. Between January and August 2020, nearly 50,000 refugees and migrants arrived in Europe, with the UN estimating a $2.9 million WASH funding requirement for 2021 in the region.[28]

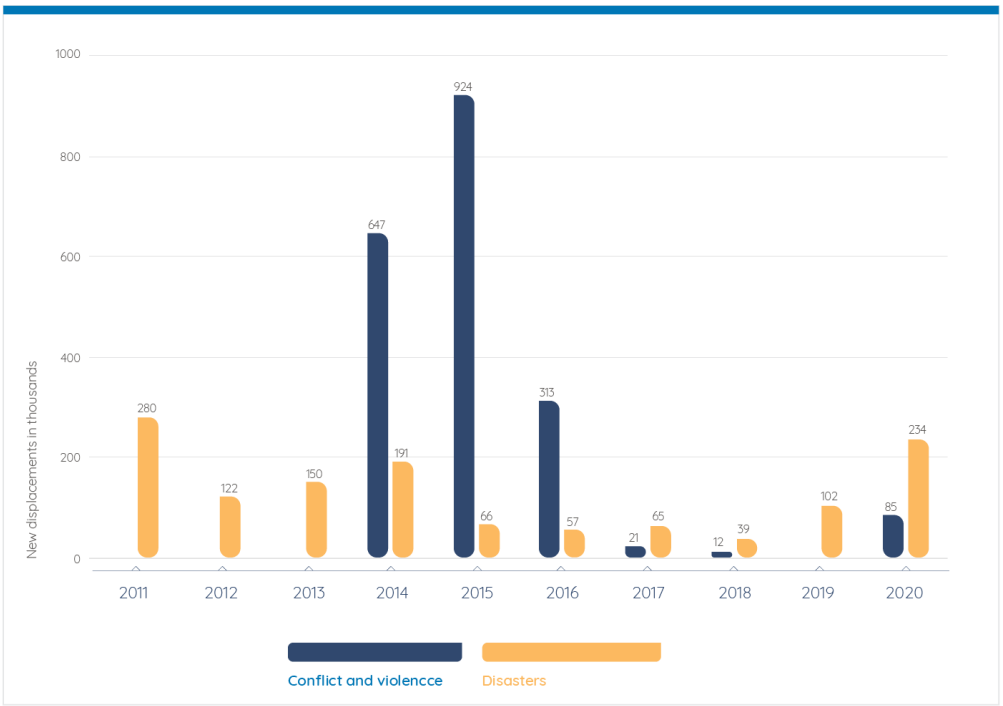

Fig. 7: New displacements by conflict, violence, and disasters in the pan-European region. Adapted from IDMC-GRID 2020 report

Undocumented migrants or migrants in transit can face numerous barriers in accessing sanitation services. There were incidences of migrants in transit in the French-Italian border practicing open defecation, overflowing toilets, and open defecation practice in Calais, France[29, 30], among others. Similarly, unsanitary conditions and waterborne diseases incidences were also observed in Brussels. [31] A large flow of migrants, particularly refugees,

can also add a burden to the existing service providers. Refugee and low-income undocumented migrants are more likely to live in informal or underdeveloped areas with a lack of safely managed sanitation services, making it challenging for service providers to meet the growing population's demand.

It is crucial to control the development of waterborne diseases among refugees, migrants, and Internally Displaced Persons (IDPs), especially during their stay in camps, as the risks are often high in such settings due to a lack of improved sanitation infrastructure.

4. POLICY ACTIONS AND ENABLING ENVIRONMENT IN SANITATION

Targeted policies that are context and setting-specific are essential. Such policy measures should take into account population density, economic fundamentals, feasible technologic solutions, and the usage of specific sanitation services.

Box 1: Republic of Moldova's Rural Sanitation Improvement Plan: Wastewater generated in rural areas of the Republic of Moldova is either pretreated and infiltrated into the environment or infiltrated directly without treatment. The government has adopted a strategy to provide all Moldovans, both rural and urban residents, with adequate sanitation by 2028. The government has been implementing low-cost decentralized and individual sanitation systems such as septic tanks, urine-diverting dry toilets, and constructed wetlands to achieve this goal. These unique and decentralized sanitation systems are ideal for sparsely populated areas as the investment to connect to the centralized sewer system could potentially increase the sanitation service cost for households. [18] Selection of locally-appropriate sanitation solutions is essential for achieving SDG Goal 6.2 and should be based on the needs, as well as available financial and management resources.

Universal access to sanitation will lower the burden of diseases in the region, support environmental protection, close the inequity gap between rural and urban areas and promote gender equity and education. In the long and medium-term, investment in sanitation can support a healthier, educated, more productive, and resilient population. A recent report from the NGO WaterAid, based on research by Vivid Economics, estimates that safely managed sanitation can yield US$ 86 billion per year globally in the form of time savings, lower health costs, and improved productivity. [32] Addressing sanitation challenges requires significant public investment but every US$ 1 spent on improving sanitation yields a return of US$ 5 by improving people's livelihood and health. [33]

Among the 15 countries that participated in the latest GLAAS cycle, mainly in Eastern Europe, Central and Western Asia, one-fifth of participating countries either did not have any financial plans for sanitation or had one in development (Fig 8). Furthermore, one-third of the countries reported a financial sufficiency gap of over 50% of the needs. Ageing infrastructure and maintenance needs add additional burden to an already lacking financial landscape for sanitation systems and services.

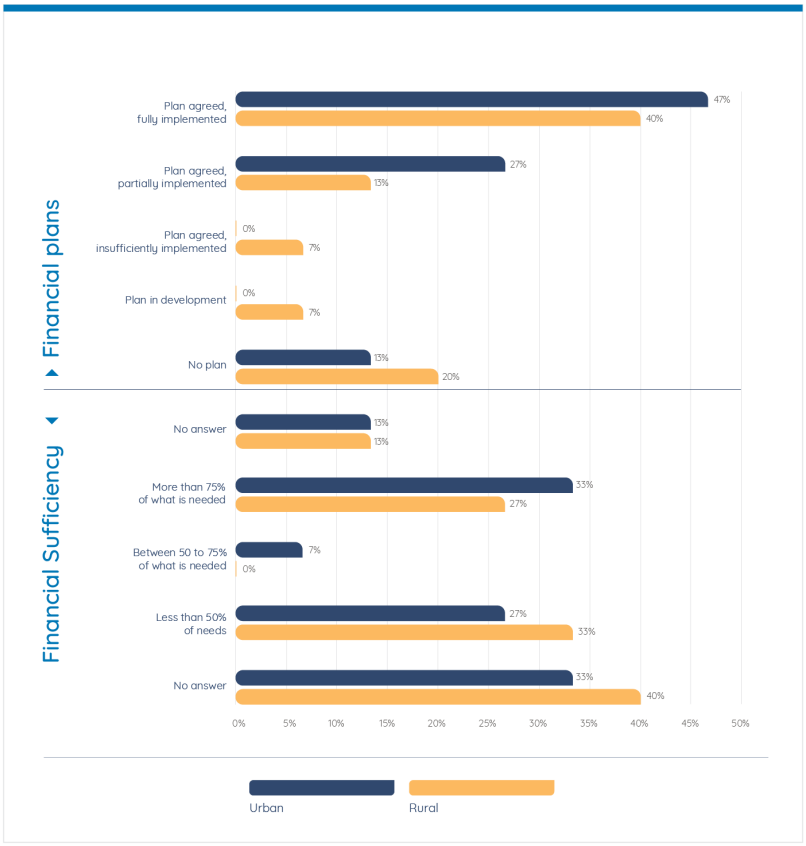

Fig. 8: Financial plan for sanitation among 15 surveyed countries in the pan-European region.

Sustainable financing for sanitation is required now more than ever, with the COVID-19 pandemic affecting millions of lives in the region. Sustainable financing strategies should include plans for sanitation services in line with overall national targets while identifying critical gaps and determining the costs of achieving those targets. Such strategies must be based on financial flows and a life-cycle approach to the costing and financing of sanitation services.

A framework for sustainable financing of sanitation services allows policymakers to set targets, identify fit-for-purpose sanitation technology and services to meet the targets, determine the technology's life cycle costs, and link funding sources to cost categories to finalize the overall strategy. As described by Organization for Economic Co-operation and Development (OECD), Tariffs, Taxes, and Transfers (3Ts) are usually the fundamental source of revenue for water and sanitation services. Tariffs are expenses paid by the users to cover capital, operational, and maintenance costs for appropriate sanitation technology. Taxes are funds provided by domestic taxpayers through the government, and Transfers are external funds. Costing and financing of small systems developed under the Protocol of Water and Health also provide national and subnational policy-makers responsible for sanitation interventions with guidance on specific strategies for sustainable financing of service provision. [34]

Other sanitation financing strategies can incentivize sector performance, improve subsidy targeting, promote sector financial planning and management, tariff reforms in policies, a blended finance approach, and public-private partnership. Certain strategies might fit specific parts of the region better; countries in the pan-European region should explore the best financing strategies based on their country context, need, and resources. Improving subsidy targeting could be a better strategy in rural settings in Central and Western Asia with minimal

access to sanitation services. While the blended finance approach enables commercial investors to incentivize sector performance by encouraging accountability and transparency; so, it could be a good option for growing cities and small towns. Countries in Western, Northern and Southern Europe with ageing infrastructure could implement tariff reform to replace/maintain the sewage treatment facilities and pipes incrementally.

Box 6: Sector Investment in Poland: A total of 16.9 billion Euros (12.9 billion Euros allocated by the EU of common funds, 4 billion Euros of Polish PPP) was invested in Polish water and wastewater infrastructure between 2004 and 2005. With the investment, 1,206 wastewater treatment plants were modernized, and 376 new treatment plants were built. Over 76,000 km of sewage networks were also built with this investment. Because of leakage reduction, renewed and upgraded infrastructure, education, and smart networks, many cities, including Warsaw, reduced water use by 25%. Such investments in infrastructure can lead to higher water quality, climate resiliency, and better treatment efficiency.

Sanitation Technology

Climate change and increasing water stress have led to an urgent need to develop more cost-effective and resource-efficient sanitation systems in the pan-European region. These systems must deliver the desired services of urban water management without the prohibiting constraints of the conventional centralized system. Cases in point are distributed systems (or small-scale systems) that allow reducing net water consumption and utilizing the available water more efficiently. Three main strategies designed to increase water productivity are (i) reducing water waste, (ii) down-cycling or reuse of lower-quality water, and (iii) regenerating high-quality water from used (or treated) water. In the last two strategies, the collected wastewater is, in most cases, treated in wastewater treatment plants, making it fit for reuse. Simultaneously, distributed systems will also require innovations in organizational and regulatory models, including public-private partnerships.

5. PROMOTING SAFE MANAGEMENT APPROACHES

Sanitation Safety Planning (SSP)

A Sanitation Safety Plan is a risk-based management tool for sanitation systems focusing on human waste, which provides practical step-by-step guidance to assist in implementing the 2006 WHO Guidelines for Safe Use of Wastewater, Excreta, and Greywater. [35] SSPs can play a critical role in ensuring the safety of the entire sanitation service chain.

Risk assessment and management are essential components of SSPs, supporting the achievement of SDGs 6.2 and 6.3. The critical components of SSPs are hazard identification, risk management, use of barriers for risk reduction, routine monitoring and review, and a commitment to incremental improvements (Box 2).

Box 2: SSP Framework and Benefits[35]

SSP, a risk management tool, targeted for use by local authorities, wastewater utility managers and sanitation enterprises, and farmers, for sanitation systems, assists users to:

- Systematically identify and manage health risks along the sanitation service chain
- Guide investments based on actual risks, to promote health benefits and minimize adverse health impacts
- Provide assurance to authorities and the public on the safety of sanitation-related products and events

Currently, there is no overview of the implementation of SSP in the region. Limited data from 15 countries, obtained through Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) report, indicate that only two out of 15 countries in the pan-European region have formally approved an SSP plan, three are under development, and most of the countries report no instrument for urban or rural SSPs (Fig 9). This highlights the need for adapting SSPs throughout the region in the coming years. The need to adapt and implement risk-based approaches like SSPs that cover the entire sanitation chain addresses on-site and off-site sanitation. Water and Health Protocol's program of work for 2020-2022 has emphasized further building capacity at national, sub-regional, and regional levels on SSP approaches in policy and practice.

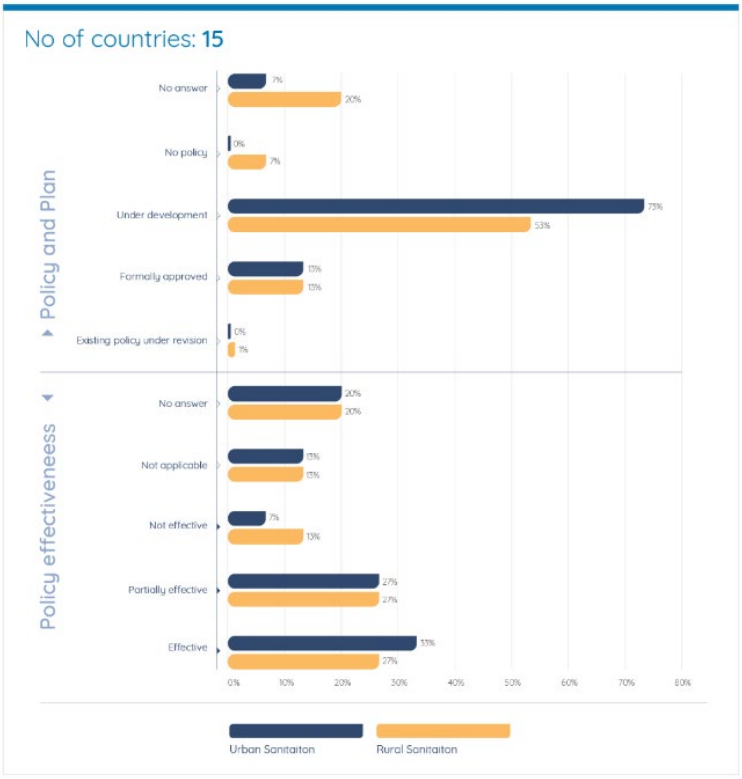

Fig. 9: Policy and plans and its effectiveness based on SSPs and their effectiveness in the pan European region

Box 3: SSP in Helsinki, Finland: The city of Helsinki has two wastewater treatment plants for a population of two million residents. The local authority that manages the water and sanitation sector for the area developed its own web-based health and environmental risk management tool. This SSP concept is aimed at managing the wastewater cycle risks from wastewater collection to the receiving bodies. The first SSP identified nearly 800 control measures, out of which 600 were implemented, whereas only 180 control measures were identified the following year. The web-based tool has undergone several improvements to make it user-friendly and minimize errors. Well-designed and targeted SSPs can be instrumental in managing risks in the sanitation service chain.

Circular Economy in Sanitation

A circular economy seeks to make a change to traditional financial models to make any system, including sanitation systems and services, self-sustaining and value-adding. It is a holistic approach to healthier and economically empowered communities. The standard circular economy in sanitation includes, but is not limited to, water reuse for agricultural and industrial use, reclaimed wastewater for potable use, non-sewer wastewater recycling for agriculture, and urine recycling for agriculture. Although there is an enormous potential for a circular economy in sanitation, it requires improved policy and enforcement of sewage collection, integrated planning among all stakeholders in the service chain, and effective governance for timely and efficient implementation. In addition, applying circular economy principles in WASH could provide a major opportunity to yield health benefits, contributing to achieving SDG targets. Water reuse can also help adapt cities to the impacts of climate change by providing a sustainable source of water, both for potable and agricultural use.

Box 8: Circular Economy Roadmap in the Republic of Slovenia: A national roadmap was commissioned by the Ministry of the Environment and Spatial Planning of the Republic of Slovenia with several partners with specific programs led by Ljubljana municipality to achieve a circular economy. Specific national recommendations across four sectors (food systems, forest-based value chain, manufacturing, mobility) were created with stakeholders. Among several innovative initiatives in urban refurbishment and civic waste, the city's public waste management company is now cleaning the pavements in Ljubljana with recycled water. The company collects rainwater on its buildings' roofs and uses it for street cleaning. Other complementary initiatives can add up to the ultimate goal of creating a circular economy in sanitation.

6. KEY TAKE AWAY MESSAGES FOR ACTION ON SANITATION GOVERNANCE BY NATIONAL AND LOCAL DECISION-MAKERS

Translating sound policy into practice is challenging in the sanitation sector in the pan-European region. It is the responsibility of the national and sub-national decision-makers to promote and implement strategies to improve sanitation services in the region. To develop effective policies on sanitation systems, it is essential to have a clear understanding of the prevailing situation and the political will to improve it. Despite political will and high-level commitments and signatories in the region, there is a gap in translating these commitments into agendas and investments, delivering a step-change in progress in the sanitation sector. Effective governance is also necessary. Decentralized systems led by local implementers and decision-makers who have authority over financial and human resources are crucial to address local-level challenges successfully. In addition, investment in reliable verification systems for

robust data on sanitation systems and services is critical at the local level for evidence-based, progress-changing policy implementation. Many of these strategies can work in concert with and build enabling environment for all stakeholders in the sector. Holistic approaches and system thinking must be taken into account rather than relying on standalone actions. Key take away from this brief are:

Inequitable access to sanitation is seen throughout the region, be it urban-rural inequality or wealth-index inequality. Systematic equity assessment and subsequent action plans can guide country efforts to achieve equitable access by identifying priority actions and effective approaches to their implementation. [36] The Protocol also highlights the responsibility of member states to provide equitable access to sanitation services to everyone and also has supported the countries to improve equitable access to sanitation.

Wastewater treatment, management have improved in the region in the past decade but countries in the region would require an effective regulatory framework that reflects a national interpretation of safe wastewater management and define specific roles and responsibilities. In terms of water reuse, it can have several barriers: acceptability, economic investment and viability, legislation, and proper management. The approaches for wastewater reuse should include fit-for-purpose reuse, risk assessment and management of potential pathogens in reused water, and barriers to limit contamination and exposure. Parties to the Protocol contribute to assessing programs and developing the evidence base for WHO guidelines on wastewater reuse.

Health risks from different microorganisms, including AMRs, change substantially between different steps in the sanitation ladder – especially from open defecation to safely managed sanitation. Planned and inclusive sanitation interventions for the different pathways can significantly reduce health risks. Furthermore, the COVID-19 pandemic has exacerbated the existing burden on water and sanitation systems in the region. The pandemic has highlighted the need for safely managed WASH services in preventing disease and promoting human health, especially during outbreaks of infectious diseases.

There is no one-size-fits-all solution for adaptation to climate change in sanitation. Each country in the pan-European region should develop specific policies considering their unique risks and resources. Increasing the frequency of natural disasters in the region requires risk mapping and subsequent interventions in developing efficient climate-resilient sanitation systems. There is no one-size-fits-all solution for adaptation to climate change in sanitation. Each country in the pan-European region should develop specific policies considering their unique risks and resources.

Smart and sustainable investments are critically important to resolve ageing infrastructure issues throughout the pan-European region. The life cycle approach to costing of sanitation services must be considered for sustainable financing of new and up-to-date infrastructure.

Displacements, migration population growth or shrink all inflict stress on existing sanitation systems and services, which require effective planning either to accommodate the new residents or to maintain with low residents. In such cases, cities and small towns should strengthen governance and existing services and prepare for future projections to efficiently cope with the WASH effects of demographic change and migration.

Setting effective policies and financing mechanisms in place are essential at the local, regional and national levels to address the current and future challenges in the sanitation sector. Table 1 highlights sub-region-specific recommendations for improving sanitation services in the region. In addition, Fig 10 illustrates how inclusive enhanced sanitation

governance with appropriate policies in place can help address the forces of change faced by the sanitation sector.

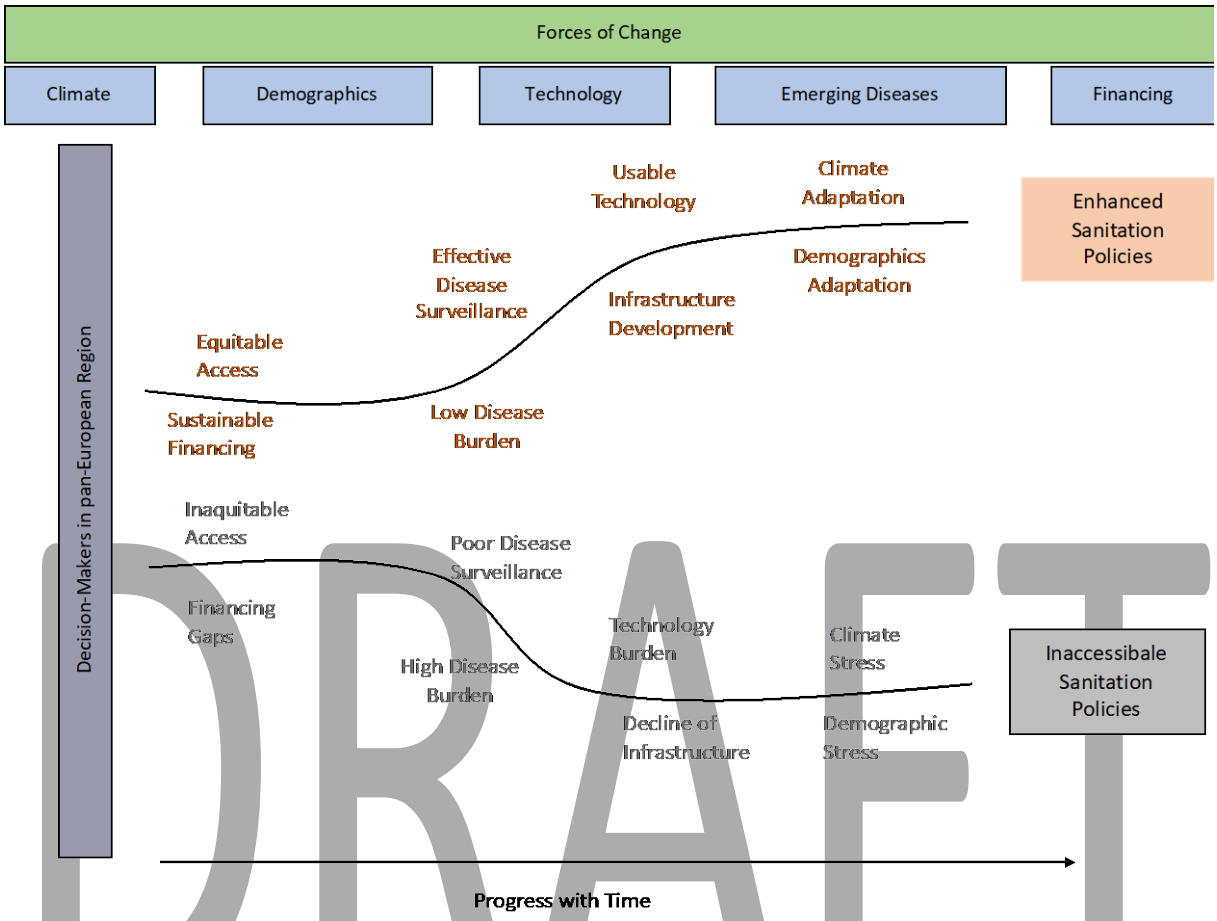

Fig. 10: Illustration for the need for enhanced and effective sanitation policies in the pan-European region

Table 1: Sub-region-specific considerations for improving sanitation system and services in the region

Sub-Region	Access to Sanitation	Wastewater Collection, Treatment and Reuse	Surveillance	Enabling Environment
Southern Europe	• Increase access to basic sanitation, especially in rural areas • Incrementally improve access to safely managed services	• Introduce decentralized WWTP in rural areas • Investigate opportunities for planned wastewater reuse • Implement risk assessment and risk management approach in the entire sanitation chain	• Invest in surveillance for water and sanitation-related diseases incidents and outbreaks to obtain overview of disease burden and for timely intervention and planning of sanitation systems and services	• Policy actions for addressing affordability gaps and including regulatory framework for at national level • Increasing coverage to safely managed services, implementation of SSPs
Northern Europe	• Incrementally improve access to safely managed services	• Introduce decentralized WWTP in rural areas • Investigate opportunities for planned wastewater reuse • Implement risk assessment and risk management approach in the entire sanitation chain	• Expand wastewater-based disease surveillance systems for other pathogens including SARS-CoV-2 and contaminants • Regulate the discharge of micropollutants from WWTP	• Review existing enabling environment and identify gaps and take policy improvement actions • Explore financing options like tariff reform to incrementally replace/maintain sewage treatment facilities and pipes • Increasing coverage to safely managed services, implementation of SSPs
Western Europe	• Increase access to safely managed sanitation in the rural areas	• Investigate opportunities for planned wastewater reuse • Implement risk assessment and risk management approach in the entire sanitation chain	• Expand wastewater-based disease surveillance systems for other pathogens including SARS-CoV-2 and contaminants • Regulate the discharge of micropollutants from WWTP	• Review existing enabling environment and identify gaps and take policy improvement actions • Explore financing options like tariff reform to incrementally replace/maintain sewage treatment facilities and pipes • Increasing coverage to safely managed services, implementation of SSPs
Eastern Europe	• Increase access to basic sanitation, especially in rural areas • Incrementally improve access to safely managed services	• Increase connection to sewers and reduce the discharge of untreated wastewater and sludge • Investigate opportunities for planned wastewater reuse	• Invest in surveillance for water and sanitation-related diseases incidents and outbreaks to obtain overview of disease burden and for timely intervention and planning of sanitation systems and services	• Policy actions for addressing affordability gaps and including regulatory framework for at national level • Explore financing options like blended finance approach for growing cities and small towns • Increasing coverage to safely managed services, implementation of SSPs
Central Asia	• Increase access to basic sanitation, especially in rural areas • Incrementally improve access to safely managed services	• Increase connection to sewers and reduce the discharge of untreated wastewater and sludge • Investigate opportunities for planned wastewater reuse	• Invest in surveillance for water and sanitation-related diseases incidents and outbreaks to obtain overview of disease burden and for timely intervention and planning of sanitation systems and services • Specific interventions must be designed to reduce the cases of STHs	• Policy actions for addressing affordability gaps and including regulatory framework for at national level • Explore financing options like improved subsidy targeting to provide on-site sanitation services • Increasing coverage to safely managed services, implementation of SSPs
Western Asia	• Increase access to basic sanitation, especially in rural areas • Incrementally improve access to safely managed services	• Increase connection to sewers and reduce the discharge of untreated wastewater and sludge • Investigate opportunities for planned wastewater reuse	• Invest in surveillance for water and sanitation-related diseases incidents and outbreaks to obtain overview of disease burden and for timely intervention and planning of sanitation systems and services • Specific interventions must be designed to reduce the cases of STHs	• Policy actions for addressing affordability gaps and including regulatory framework for at national level • Explore financing options like improved subsidy targeting to provide on-site sanitation services • Increasing coverage to safely managed services, implementation of SSPs

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