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

Twelfth meeting
Geneva, 14 and 15 April 2021
Item 5 of the provisional agenda
Protocol on Water and Health and implementation of its programme of work for 2020–2022 in the context of the coronavirus disease (COVID-19) pandemic

Informal document

Background note for strategic roundtable on increasing resilience to climate change through the Protocol on Water and Health

Prepared by the joint secretariat, with the support of a consultant

1. INTRODUCTION

Without any doubt, the introduction of water supply and sanitation has been a development and medical milestone and boosted improvement of living conditions in human history. There is a consensus on the strong links between water supply and sanitation systems and environmental protection, prevention of disease, poverty alleviation and food security. Despite this, in the pan-European region, over 16 million people still lack access to basic drinking water and more than 31 million people are in need of basic sanitation. Significant inequalities persist between rural and urban areas, and between rich and poor people, with rural dwellers and the poorest being the most disadvantaged.[1]

The impacts of climate change on water and sanitation services, including water supply, sewerage and wastewater treatment, make harder to achieve universal and equitable access to safe water and sanitation and compromise their environmental and health benefits. Climate change alters hydrological cycles, altering rainfall patterns and increasing temperatures, and affects the intensity, duration, and frequency of drought events. Altered precipitation patterns increase the risk of localized flood events, resulting in direct injury, the spread of infectious diseases, and impacts on mental health.[2]

[1] WHO Regional Office for Europe. https://www.euro.who.int/en/health-topics/environment-and-health/water-and-sanitation/data-and-statistics (Accessed in Dec 2020).

[2] Watts N, Amann et al. (2020). The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. The Lancet. 397(10269):129-170; doi: https://doi.org/10.1016/S0140-6736(20)32290-X.)

Climate effect	Hazard	Impact on WASH sector
Decrease in precipitation	Drought	Reduction in raw water supplies, reduced flow in rivers, less dilution/increased concentration of pollutants in water, challenge to hygiene practices.
Increase in precipitation and severe weather	Flooding	Pollution of wells, inundation of wells, inaccessibility of water sources, flooding of latrines, damage to infrastructure, landslides around water sources, sedimentation and turbidity, challenges to sustainability of sanitation and hygiene behaviours, and waterborne diseases.
Increase in temperatures	Heatwaves	Damage to infrastructure, increase in pathogens in water leading to increased risk of disease.
	Melting and thawing of glaciers, snow, sea ice and frozen ground	Seasonality of river flows affected leading to a reduction in water availability in summer.
Sea-level rise	Flooding and saline intrusion into freshwater aquifers	Reduction in availability of drinking water, with high impacts on quality.

Figure 1. Examples of climate change impacts of hazards on the WASH sector[3]

These impacts have already become a reality in the pan-European region. Indeed, a region that encompasses a wide range of climates and heterogeneous environments, ranging from arid and semi-arid climate in Central Asia to subtropical Mediterranean and water-rich Northern Europe.

The observed climate trends and future climate projections show consistent increases in temperature throughout the region and varying changes in rainfall. Projected increases in precipitation are expected in Northern Europe and decreasing precipitation in Southern latitudes. Climate projections show a marked increase in high temperature extremes, meteorological droughts, and heavy precipitation events, with variations across the pan-European region.[4]

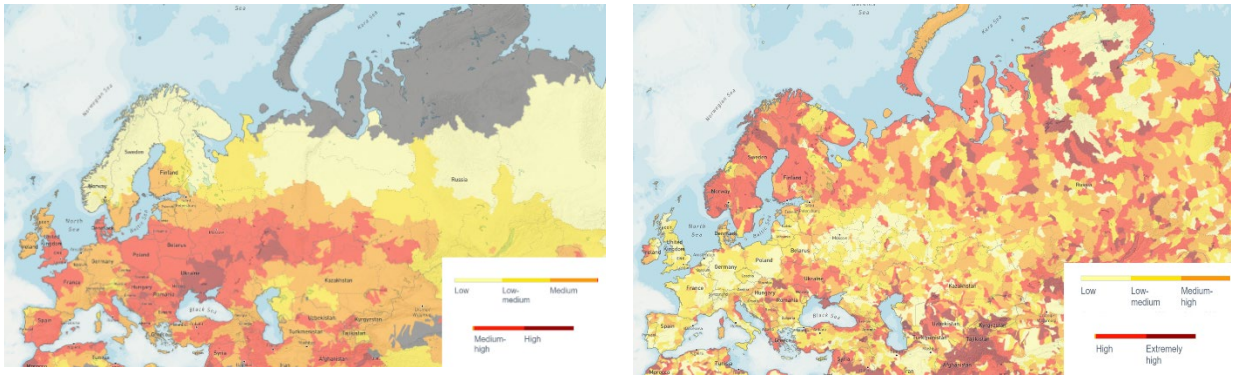

Figure 2. Drought risk (left) and riverine flood risk (right) in the pan-European region[5]

[3] GWP-UNICEF Strategic Framework for WASH Climate Resilient Development, 2017.

[4] Kovats, R.S., et. Al., Europe. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267-1326.

[5] World Resource Institute's Aqueduct tool https://www.wri.org/aqueduct. Baselines developed in 2019: a) Drought risk: measures where droughts are likely to occur, the population and assets exposed, and the vulnerability of the population and assets to adverse effects; b) Riverine flood risk: measures the percentage of population expected to be affected by Riverine flooding in an average year (map shows baseline for 2019), accounting for existing flood-protection standards.

Climate change impacts in the pan-European region may further exacerbate post-industrial pollution phenomena, hydrogeological and seismic vulnerability as well as expansion of urban areas and their populations. There is an increasing trend of human migration in the pan-European Region due to climate-related risks in the neighbouring areas, in addition to geopolitical and security drivers.

The Goal 6 of the 2030 Agenda for Sustainable Development on clean water and sanitation for everyone is essential to the reaching of most of the Sustainable Development Goals. Water is also a strategic resource in preventing the coronavirus disease (COVID-19), recovering from the pandemic and building resilience to this and other epidemics.

The 1999 Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes is the first international agreement of its kind adopted specifically to attain an adequate supply of safe drinking water and adequate sanitation for everyone, and effectively protect water bodies used as a source of drinking water or for recreation.

With the aim of developing capacity and promoting good practices, the joint secretariat of the Protocol, provided by the United Nations Economic Commission for Europe (UNECE) and World Health Organization Regional Office for Europe (WHO/Europe), is planning to convene a multi-sectoral strategic roundtable on increasing resilience to climate change in the pan-European region, to which this note serves as a background. In this context, the following chapters provide discussion points on how the Protocol can support establishing climate-resilient water and sanitation services and strengthening climate considerations in water and sanitation policy making.

Potential target audience are decision makers both from the climate sector and from the environment, water, sanitation and public health communities at the national and local level, as well as civil society, the private sector and academia.

2. THE PROTOCOL ON WATER AND HEALTH AND CLIMATE CHANGE

The Parties to the Protocol on Water and Health have been working since 1999, with support of UNECE and WHO/Europe, to build tools to enable climate resilient water and sanitation services for the pan-European region[6], with the objective of strengthening communities' resilience to water-related disasters and other climate change induced effects.

This section reviews the relation between climate change and the Protocol provisions, and then discusses climate change considerations within the technical areas of work of the Protocol.

2.1 Climate change and the legal provisions of the Protocol

Although climate change had not been explicitly mentioned in the legal text of the Protocol at the time of drafting, closer analysis reveals the extent to which climate change relate to its provisions. The Protocol principles and approaches set in article 5 refer to management of water resources so that the needs of the present generation are met without compromising the ability of future generations to meet their own needs. Indeed, this calls for an adaptive management of water resources to climate change where decisions, inter alia, need to be informed by observed climate trends and projections. Also, the principle on "preventive action" calls for considering the effects of climate change and variability on water resources management, for instance through implementation of water-efficiency and conservation programmes and promotion of reuse in drought prone areas.

Furthermore, to meet the objectives of the Protocol goals, article 6.1 requires its Parties to pursue access to drinking water and provision of sanitation for everyone. In doing so, the impacts of climate

[6] Climate-resilient water & sanitation services: supporting action through Protocol on Water & Health

change require due consideration, and strengthening the climate-resilience of water and sanitation is an essential ingredient in ensuring universal and equitable access to safe services for this and next generations.

According to article 6.2 of the Protocol, each Party has the obligation to establish and publish national targets within 2 years of becoming a Party. The targets shall cover the areas stipulated in article 6, paragraphs 2 (a) to (n), except where national circumstances make them irrelevant for preventing, controlling, and reducing water-related disease.

The following table provides selected references showing the impacts of climate change on the different target areas, then shows climate sensitive targets or issues raised by Parties to the Protocol in previous reporting cycles. The table also shows examples of generic model targets for discussion.

Table 1. Climate change considerations to target areas under article 6.2 of the Protocol

Art. 6.2.a Drinking water quality	**Selected references to climate change impacts**	• Within large reservoirs, higher water temperatures can reduce dissolved oxygen levels and increase benthic nutrient (such as phosphorus) release. This promotes (harmful) phytoplankton proliferation – including toxic cyanobacteria – and release of sediment-bound metals, such as iron and manganese, into the water body (Hou et al., 2013). • Furthermore, higher water temperatures which often coincide with water scarcity, tend to increase the load of pathogens/pollutants/other contaminants, as the water dilution capacity is reduced, resulting into decreased chemical and biological water quality conditions. (Laaha, G., et.al. 2017). • Drought induces low water flows and reduced water levels in surface water bodies which tends to increase the concentration of pathogens, chemical pollutants and nutrients (Sirbu et al., 2012). Drying and water scarcity may result in the over-exploitation of groundwater resources, reducing their availability as well as impairing their quality (through contaminant concentrations) with harmful consequences for water supply to the population. (Sinisi L., et.al 2011). • Extreme weather events or drought trends may result in intermittent water supply thus inducing serious effects on water quality and health (WHO). • Increasing temperatures may lead to increased growth of pathogens in the drinking water supply system, e.g. Legionella (WHO)
	Example of climate sensitive targets or issues raised in previous reporting	• Target: (in relation to climate action) improve collection of drinking water quality monitoring data in emergency situations through the development of an electronic system. (Russian Federation). • Target: (in relation to climate action) improve collection of drinking water quality monitoring data in emergency situations through the development of an electronic system. (Serbia).
	Model targets sensitive to climate change	• Coordinate water quality (and quantity) monitoring with national climate policies, especially linking hydrological scenarios with climate scenarios and in the field of adaptation to the impacts of climate change.
Art. 6.2.b Outbreaks and water related diseases	**Selected references to climate change impacts**	• In water-stressed catchments, wastewater discharges may lead to higher concentrations of faecal matter in surface water sources, containing viral, protozoal and/or bacterial pathogens (Pandey et al., 2014). • Water shortage can contribute to the spread of microorganisms and therefore increase the risk of contracting infectious diseases (Bifulco, M., et.al. 2017). • Under dry conditions, faecal contamination may accumulate in water sources, which may enhance the probability of human contact with pathogens causing diarrhoea: (Levy K et al. 2016). • Occurrence of waterborne diseases is related to water quality and is affected by changes in runoff, seasonality and frequency of extreme events, such as heavy rains, floods and droughts. (Smith KR et al., 2014).

		• Intermittent water supply may detach biofilm, warmer temperatures may cause Legionella proliferation in distribution systems.
	Example of climate sensitive targets or issues raised in previous reporting	• *Examples to be collected*
	Model targets sensitive to climate change	• Conduct studies to project water related disease burden under future climate scenarios, factoring the social and environmental conditions that affect pathogen exposure, host susceptibility, and a community's ability to respond to stress.
Art. 6.2.c Population served - Water supply (collective systems or other means)	**Selected references to climate change impacts**	• Water stress is expected to increase across central and southern Europe and central Asia. The estimated proportion of the area of the European Union under high water stress is forecast to increase from 19% in 2007 to 35% by the 2070s, by which time the number of additional people affected is expected to be 16–44 million (Alcamo et al., 2007). • Globally, each 1 °C of temperature increase caused by global warming is projected to result in a 20% reduction in renewable water resources and to affect an additional 7% of the population (Jiménez Cisneros et al., 2014). • The number of people in the European Union and the United Kingdom living in areas considered to be under water stress for at least one month per year could rise from 52 million nowadays to 65 million, in a 3°C warming scenario, which is equivalent to 15% of the EU population. (Feyen Luc, et.al., 2020). • Central Asia is likely to have reduced availability of freshwater. Similar situations may occur in central and eastern Europe, where freshwater flows may decrease by 80% (Alcamo et al., 2007).
	Example of climate sensitive targets or issues raised in previous reporting	• Ensuring delivery of supply including under the increasing impacts of climate change (Netherlands). • The NFSA is currently preparing a guidance on limiting environmental impact as well as preparing for climate change in water and sanitation planning. (Norway). • Maintain a minimum water supply in drought periods (Spain).
	Model targets sensitive to climate change	• Developing national (or sub-national) water and sanitation risk assessments linked to main climate hazards and with focus on the exposure of population and water-sanitation infrastructure, and the vulnerabilities of the sector to identify priority interventions. • Launching national behavioural change campaigns linked to water stress and scarcity to change consumption and lifestyles. • Developing energy efficient desalination plants (where feasible and appropriate). • Incentivizing corporate water footprint assessments linked to overall business sustainability.

Art. 6.2.d Population served – Sanitation (collective systems or other means)	**Selected references to climate change impacts**	• Declining water availability and increased flooding may limit access to sanitation and poses major threats to sewerage and septic system reliant on water. Securing sufficient water to ensure conventional sewers function as designed may be problematic and, even for modified sewerage, securing sufficient volumes of water for flushing and operation may be challenging. (Howard et al., 2016).
	Example of climate sensitive targets or issues raised in previous reporting	• Maintenance of the sanitation systems and improvement, also in the perspective of climate change (resilience) (Netherlands) • The NFSA is currently preparing a guidance on limiting environmental impact as well as preparing for climate change in water and sanitation planning. (Norway).
	Model targets sensitive to climate change	• Developing national (or sub-national) water and sanitation risk assessments linked to main climate hazards and with focus on the exposure of population and water-sanitation infrastructure, and the vulnerabilities of the sector to identify priority interventions. • Prioritizing the provision of facilities and services for safely managed sanitation, and update sanitation infrastructure in high flood risk areas.
Art. 6.2.e Performance of water and sanitation systems	**Selected references to climate change impacts**	• Traditionally, water and wastewater services were built to protect people from unsafe water, and to protect the environment from dangerous pollution. Under extreme weather conditions, even "gold-standard" technologies may be challenged and not be able to meet these goals. Climate change may further accelerate the challenges posed by extreme events. (Sinisi L., et.al 2011). • Drought may lead to the use of less safe alternative water sources. Any saltwater intrusion into drinking-water sources can increase water treatment costs for salt removal (Jiménez Cisneros et al., 2014). • Higher frequencies of torrential rains, leading to rapid runoff (or ingress to groundwater sources) and poor water quality (Jiménez Cisneros et al., 2014) compromising performance of water treatment and increasing treatment costs.
	Example of climate sensitive targets or issues raised in previous reporting	• The Finnish Environment Institute and water utilities have made research and plans on climate change vulnerability of groundwater and adaptation of water infrastructure. (Finland). • Integrating future climate projections in storm water management to avoid overloading of the sewerage collecting system (Norway). • Target: [Ensure] the presence of collective system operators capable of responding at the regional level to mitigate the effects of extreme weather conditions and serious emergencies. (Republic of Moldova). • Target: collecting systems shall be designed, constructed and maintained in accordance with best technical knowledge and not entailing excessive costs, notably regarding (..) limitation of pollution of receiving waters due to storm overflows (Spain).

	Model targets sensitive to climate change	• Assessing exposure and vulnerability of water and sanitation infrastructure. • Strengthening the most at-risk sanitation distribution and treatment infrastructure to prevent service disruptions and contamination of water sources. • Improving the most at-risk water distribution infrastructure to increase efficiency. • Assessing water storage needs and best solutions in water scarce and drought prone areas. • Studying the right mix of water sources (e.g., surface, groundwater, rain) to strengthen resilience of water systems in water scarce and drought prone areas. • Strengthening national planning and implementation of interventions on water infrastructures (e.g., dams, reservoirs) and connection of water distribution systems to drought adaptation. • Supporting development of safe and sustainable desalination facilities, including by developing national guidelines.
Art. 6.2.f Water supply and sanitation management	**Selected references to climate change impacts**	• Drought spells may imply restrictions and prioritization of water use, control of drinking-water quality and compromised efficiency of sanitation systems. (Sinisi L., et.al 2011). • Increase in temperature is associated to an increase in household water demand, especially during the hot season, a point that needs to be considered as part of water demand management. (Sinisi L., et.al 2011).
	Example of climate sensitive targets or issues raised in previous reporting	• All the measures related to IWRM are part of river basin planning and are focused on: optimum water supply for all users and reducing harmful effects of water due to floods, droughts (climate change) and accidental pollution (Romania).
	Model targets sensitive to climate change	• Implementing water demand management policies and strategies to emphasize water conservation, efficiency and reuse. • Implementing climate resilient Water Safety Planning and Sanitation Safety Planning. • Supporting inter-sectorial cooperation to develop policy and plans for managing high demand of water for specific uses (e.g., agriculture, irrigation of green infrastructures in cities, industries)
Art. 6.2.g Discharges of untreated waste/storm water	**Selected references to climate change impacts**	• Of special concern is the disruption of sanitation systems during extreme weather events. Flooding may cause contamination and, especially in large cities, storm-water overflows and pollution (UNECE, 2009). • Prolonged periods of droughts may lead to malfunctioning of wastewater treatment systems. (Sinisi L., et.al 2011).
	Example of climate sensitive targets or issues raised in previous reporting	• Extreme rainfall events causing Heavy rains related to climate change will become more usual but, at present, there are no national statistics available indicating the number of overflows caused by this type of rains. Target: Preventive action shall be taken to prepare for overflows caused by exceptional rainfalls. (Finland). • Significant additional operational costs due to increased pumping energy demand and disruption of the operation of the wastewater treatment plant. (Hungary).

		• Building rainwater retention basins, storm water basins and pumping stations helps managing rainy periods that are likely to intensify as a result of climate change (Luxemburg). • An official Norwegian Report was published in January 2016 with focus on climate and storm water in cities and with proposals on changes in some national regulations.
	Model targets sensitive to climate change	• Assessing exposure of wastewater treatment plants to extreme weather events and floods and identify appropriate solutions to avoid discharges of untreated waste or storm water
Art. 6.2.h Quality of treated wastewater	**Selected references to climate change impacts**	• Treatment of wastewater to raise it to adequate parameters becomes technologically more challenging with increased temperatures and increasing and varying concentrations of pollutants of wastewater inflows. (Sinisi L., et.al 2011).
	Example of climate sensitive targets or issues raised in previous reporting	• 53% of wastewater in Israel has tertiary treatment (filtration and disinfection) and treated wastewater is reused, mainly in agriculture. • The national target is to decrease pollutant loads of discharged wastewater from wastewater treatment plants to the environment by upgrading facilities and by sustainable maintenance of wastewater treatment plants (Israel).
	Model targets sensitive to climate change	• Assessing at national level, compliance of treated wastewater effluents with minimum discharge requirements after extreme weather events and flooding, and develop remediation action plans.
Art. 6.2.i Disposal or reuse of sewage sludge and the quality of wastewater used for irrigation purposes	**Selected references to climate change impacts**	• Due to expected reductions in water availability caused by an increase of water use and by climate change effects, water reuse is becoming an important component of the water balance in countries. However, treatment of wastewater to raise it to adequate parameters becomes technologically more challenging with increased temperatures and increasing and varying concentrations of pollutants of wastewater inflows. (Sinisi L., et.al 2011). • Warmer temperature leads to increased fermentation of solids in the sludge, which causes odor issues (KWL, 2008). • Fecal sludge management (FSM) chains may be vulnerable to climate impacts. In urban areas in particular, FSM as a system is gaining traction as the demand for low-cost toilets drives the demand for simple pit latrines, but space constraints preclude approaches used in rural areas (replacing latrines once a pit is full). Typically, FSM chains involve collection and transportation of waste in vehicles, with disposal in a treatment facility. Clearly, risks of flooding will impact the ability of emptying vehicles to access communities if roads become impassable. (Howard et al., 2016).

	Example of climate sensitive targets or issues raised in previous reporting	• Climate change will increase pressure on safe and adequate water supply and sanitation provision. The practice of reuse is thus likely to increase, as this can be an effective measure to reduce water scarcity (Netherlands). • Target: Absence of disease cases proven to be related to the reuse of treated urban wastewater and to the application in agriculture of sewage sludge from wastewater treatment plants. (Portugal). • A National Strategy, specific legislation for various uses and a Guide for the implementation and management of water reuse projects are being finalized. (Portugal). • Target: To develop the Strategy I Program for the reuse of wastewater in conditions of climate change for Ukraine up to 2030 and the relevant regulatory acts. (Ukraine).
	Model targets sensitive to climate change	• Prioritizing the upgrade of wastewater treatment plans to the hights treatment level possible and foster reuse for irrigation.
Art. 6.2.j Quality of water used as sources for drinking, bathing or aquaculture	**Selected references to climate change impacts**	• Algae proliferation may increase, due to higher temperatures, in source waters, such as cyanobacteria, possibly impacting recreational activity but also the food-chain by consumption of contaminated fish (Zanchett & Oliveira-Filho, 2013). An additional area of concern is the production of seafood in aquaculture, which takes place in coastal zones (De Silva & Soto, 2009). • Rains lead to higher concentrations of pathogens in the aquatic environment, affecting the quality of bathing water, drinking-water resources, and potentially some foods such as aquatic and aquaculture products. Heavy rains and floods can also increase the nutrient availability of lakes, inducing cyanobacterial proliferation. (Sinisi L., et.al 2011). • Climate change is also likely to affect the quality of coastal waters, by changing either natural ecosystems or the quality of the waters draining into coastal zones. Recreational users of bathing waters, including tourists, may face poorer water quality and a higher risk of infection (Sinisi L., et.al, 2011; Jiménez Cisneros et al., 2014). Along with coastal flooding and the encroachment of saltwater farther inland comes an increased risk of human interaction with pathogenic *Vibrio* species, such as *Vibrio cholerae*, *V*. *vulnificus* and *V*. *parahaemolyticus*. (Brett A. F, et.al. 2020).
	Example of climate sensitive targets or issues raised in previous reporting	• Changes in the climate observed in recent years (temperature rise) and other human factors created favourable conditions for algae growth. Large-scale eutrophication processes were observed in the coastal areas as well as in the shallows and bays, potentially leading to deterioration of water quality. (Armenia). • Protection of priority water catchment being discussed in the context of climate change adaptation (France). • Desalinated water provides 50% of Israel's drinking water and is used in water supply systems. The national target is to monitor water quality in the distribution system through a computerized system for efficient monitoring of water quality parameters. Also, water stabilization values and effect on pipes are monitored as well as the presence of essential minerals (Calcium and Magnesium), accompanied by epidemiological and ecological studies. (Israel).

	Model targets sensitive to climate change	• Developing real time monitoring systems for water quality of sources used for drinking, bathing and aquaculture in areas exposed to climate hazards and extreme weather, linked to early warning systems. (Including trans-boundary where appropriate). • Developing safe and sustainable reuse practices in multiple sectors/areas (e.g. agriculture, civil uses, aquifer recharge, etc.), including by developing national guidelines and intersectoral programmes.
Art. 6.2.k Management of enclosed waters[7] available for bathing	**Selected references to climate change impacts**	• With increased warming, enclosed waters for bathing will undergo larger evaporative water losses due to the hot, arid climate, and will rely on imported water supplies. Policy measures might be implemented during droughts, including a ban on outdoor uses of water. (Valeria B. et.al, 2013).
	Example of climate sensitive targets or issues raised in previous reporting	• Drinking water supply and sanitation shall be subject to the principle of preparedness and comprehensive risk management (Water Cycle Safety Plan, WCSP) which comprises the WSP model for drinking water and the SSP model for wastewater treatment and sewerage. (Finland). • Future challenges relate to potential changes in the bathing water monitoring system in general and to the introduction of new identifiable indicators and methods of analysis, specifically in relation to the impacts of climate change (Latvia).
	Model targets sensitive to climate change	• Developing water quality monitoring systems, linked to early warning, in bathing areas exposed to climate hazards and extreme weather. • Developing guidelines and (pilot) studies on recreational water safety plans.
Art. 6.2.l Remediation of particularly contaminated sites affecting waters	**Selected references to climate change impacts**	• Contaminated lands, sites with the presence of hazardous substances, are vulnerable to flooding and sea level rise. • Epidemiological evidence shows that flooding may lead to mobilization of dangerous chemicals from storage or remobilization of chemicals already in the environment, e.g., pesticides. Hazards may be greater when industrial or agricultural land adjoining residential land is affected. (Euripides E. et.al., 2004).
	Example of climate sensitive targets or issues raised in previous reporting	• In extreme weather situations rural settlements are vulnerable, since flooding or flooding toilets installed in the ground (shumbo) may cause contamination of territories and near charged sources of drinking water with contents of cesspools (Azerbaijan).
	Model targets sensitive to climate change	• Identifying and developing and action plan for the remediation of contaminated sites exposed to extreme weather events and flooding.

[7] "Enclosed waters" means artificially created water bodies separated from surface freshwater or coastal water, whether within or outside a building;

Art. 6.2.m Effectiveness of systems for the management, development, protection and use of water resources	**Selected references to climate change impacts**	• Water use has increased sixfold over the past century and is rising by about 1% a year. However, it is estimated that climate change, along with the increasing frequency and intensity of extreme events – storms, floods and droughts, will aggravate the situation in countries already currently experiencing 'water stress' and generate similar problems in areas that have not been severely affected. Poor water management tends to exacerbate the impacts of climate change, not only on water resources but on society as a whole. (UNESCO, UN-Water, 2020).
	Example of climate sensitive targets or issues raised in previous reporting	• Measures to be taken to reduce diffuse sources of pollution for groundwater bodies include research on the influence of climate change on salinization and sea levels (ongoing) (Belgium – Flanders). • All water and wastewater plants serving more than 50 persons, shall have an adequate control system that includes a risk analysis where climate impacts are included. (Norway). • Target: strengthening water resources protection (local scale, in selected protected areas). There is specific reference to the improvement of water quality/status and quantity, including by reducing the impact of climate change. (Slovakia). • Target: promoting integrated river basin management. The country considers this an opportunity for taking an efficient approach to new cross-sectoral challenges in the area of water management, including those related to climate change. (Switzerland).
	Model targets sensitive to climate change	• Promoting national water management systems to deal with the protection of water resources in terms of quantity and availability (water quantity assessment and management), including protection against floods and other emergency situations (flood management; drought management, climate change adaptation).
Art. 6.2.n Publication of information on the quality of drinking water supplied	N/A	N/A

It is expected that Parties to the Protocol consider climate change focused targets in the next reporting cycle. Those targets will have to be reviewed and monitored, linked to indicators designed to show how progress on how climate resilience prevents, controls or reduce water-related diseases, as required by Article 7 of the Protocol.

Other provisions of the Protocol are also highly relevant to adaptation to climate change, in particular, the Protocol requires to establish joint or coordinated systems for surveillance and early warning systems, contingency plans and response capacities, as well as mutual assistance to respond to outbreaks and incidents of water-related disease, especially those caused by extreme weather events (Article 8).

With the serious threat that climate change poses on the consecution of the protection of human health and well-being, as analyzed above for target areas of Article 6, it is needed to promote public awareness and better understanding of those impacts at national and local levels, and encourage research and development of integrated information systems to handle information about climate change long-term trends. The right to access to information, as discussed by Article 10 of the Protocol, is also well established in international environment and human rights instruments, including in relation to climate change. Indeed, the United Nations Framework Convention on Climate Change requires States to "promote and facilitate at the national and, as appropriate, at subregional and regional levels, public access to information on climate change and its effects."[8]

The Protocol articles calling for international cooperation (Article 11) and for joint and coordinated international action (Article 12) are very relevant for both mitigation and adaptation coordinated plans and responses to the impacts of climate change.

Finally, in relation to the links between Protocol articles and climate change, Article 13 calls Parties on "Cooperation in relation to transboundary waters". Indeed, at global level transboundary basins account for an estimated 60 percent of global freshwater flow. Transboundary cooperation in mitigation and adaptation is thus crucial to prevent possible negative impacts of unilateral measures and to make addressing climate change more effective (UN-Water, 2019). This is indeed an important area of collaboration between the Protocol and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

2.2. Climate change and the areas of work under the Protocol

The main objective of the Protocol´s programme of work (currently 2020–2022) is to support Parties in the implementation of and compliance with the Protocol, and to assist other States in acceding to and applying the Protocol. Through the programme of work it is intended to address priority challenges related to water, sanitation and health in the pan-European region.

There are 9 programme areas, and while there is a dedicated programme area to "increasing resilience to climate change", the following table provides considerations of climate relevance within each and explains progress in the area on climate change.

[8] See Article 6 "Education, training and public awareness" of the United Nations Framework Convention on Climate Change".

Table 2. Climate change considerations in the technical areas of work of the Protocol

Programme Area	Objectives	Climate Change Considerations
1. Improving governance for water, sanitation and health	Reinforce implementation of the Protocol's core provisions on target setting and reporting under articles 6 (Targets and target dates) and 7 (Review and assessment of progress).	Responses to climate change are transitioning from awareness-raising to the identification and implementation of actual country-led strategies and plans. Government leadership is essential to advance adaptation and mitigation, taking into account the fundamental connection between resilient water management and climate adaptation and mitigation policies. Currently there is a disconnect between national adaptation and mitigation targets and national water and sanitation priorities. One way to overcome this problem is by capacitating government water and sanitation decision makers and other stakeholders in key climate concepts and processes, as well as identifying potential adaptation and mitigation interventions for their sector. Moreover, it is necessary to put in place inter-sectoral frameworks and tools that allow them to participate in the formulation of targets and implementation of strategies that integrate climate with water and sanitation. The Protocol target setting framework can address these issues within the pan-European region and serve as an inspiration to others.
2. Prevention and reduction of water-related diseases	Support Parties and other States in implementing article 8 of the Protocol (Response systems), specifically to: (a) Strengthen national and local capacities regarding improving, maintaining and sustaining vigilant public health surveillance and early warning systems for water-related disease; (b) Enhance preparedness, outbreak investigation and response capacities; (c) Support building of effective drinking water quality surveillance systems	When it comes to adaptation and mitigation in the water and sanitation sector it is important to consider national weather forecasting, as well as early warning and freshwater monitoring systems. Systematic observation of the climate is usually carried out by national meteorological centers and other specialized bodies, and freshwater monitoring is generally carried out by a public water resources management body. Since national monitoring systems form part of a global network, it is vital that there is as much consistency as possible in the way measurements and observations are made. The World Meteorological Organization (WMO) performs a very important role in this respect and can support the health sector when it comes to monitoring and surveillance of climate related dimensions in WASH management. The better the information available, the more the climate and its impact on health can be understood and the more accurately future conditions can be assessed, at the local, regional, national and global levels. Strong partnerships between meteorological services, water resource specialists, and the health and water and sanitation sector are vital so that they can work together to interpret what the latest measurements mean for water and sanitation services.

3. Institutional water, sanitation, and hygiene	Support Parties and other States to ensure water, sanitation and hygiene (WASH) services in institutional settings, particularly in schools, kindergartens and health-care facilities	Schools and health care facilities must be designed, built and operated recognizing that the spatial dimension of water resources being taped, and the waste produced go well beyond the limits of the facility. Identifying the specific climate risks in each particular context helps adapting water and sanitation services and contribute to a low carbon sector. The aim is being more resilient to regular external shocks and extreme weather events, while at the same time reducing their harmful impact on the environment and surrounding communities. It is essential to ensure enough water storage, especially in drought prone areas and water scarce contexts, and to protect infrastructure from flood damage that led to contamination of water resources and the environment. Water efficiency, conservation and reuse should be observed when designing or updating water and services in institutional settings. The use of renewable energy for pumping water or wastewater, and the recovery of energy from waste need to be also considered through an intersectoral water-energy-carbon nexus approach. As earlier sections highlight the impacts of climate change on sanitation systems, it is equally important to mitigate impact of institutional sanitation systems on future GHG emissions. Therefore, reduction, adequate treatment, and recycling of waste must be ensured. Collaborative actions are needed to ensure climate resilience is well addressed when developing national or subnational standards for water and sanitation services in institutions. Based on the recently developed WHO guidelines for Climate Resilient and Environmentally Sustainable Health Care Facilities, the Protocol can serve as the instrument to implement the outlined water, sanitation and health care waste interventions in the pan-Europe region. These go around monitoring and assessing information regarding water, sanitation, chemical use and health care waste management considering climate resilience and environmental sustainability. Importantly risk management should be observed, by including assessments of climate resilience and environmental sustainability in responding to hazards and identifying and reducing exposures and vulnerabilities.
4. Small-scale water supplies and sanitation	Support Parties and other States to: (a) Increase policy focus on small-scale water supply and sanitation systems; (b) Support policy uptake and implementation of approaches based on good practices in the regulation, management and surveillance of small-scale water supply and sanitation at the national and local levels; (c) Assist Parties and other States in improving access to safe, sustainable and equitable drinking water and sanitation services in	In terms of water supply, small household or community-based supplies (springs, wells, rainwater harvesting from roofs) are classified as low climate resilient. This is because of their vulnerability to contamination (especially during flood events or with rising groundwater levels), susceptibility to drought (limited storage) and/or the difficulty in preventing damage during floods. Springs and rainwater harvesting also offer little flexibility in terms of location. From an adaptation angle, climate change may also overwhelm the ability of households and communities to deal with problems (e.g., flood damage) in situations where the quality and reliability of services is already poor. In contrast, although piped supplies may be exposed to multiple threats from source to sink, larger utilities have the potential to draw on significant human and financial capital to deal with problems and invest in more resilient infrastructure, including through decentralized management, oversight or contracting arrangements with local providers. Hence, ecosystem based adaptation to climate change benefitting from local knowledge is increasingly important in small scale water supplies and sanitation. For sanitation, resilience is directly linked to whether water is part of the technology process (e.g., sewerage), or indirectly where the capacity of the environment to absorb or reduce the effect of

	rural areas, small towns and peri-urban areas.	wastes is affected. The resilience of simple on-site sanitation is closely linked to climate scenarios. In drying environments, the risk of pollution may decline as the distance between the base of pits and groundwater (and hence travel time for pathogens) increases. Nonetheless, on-site sanitation may still be vulnerable to damage from short-term flood events. Where rainfall and/or flooding increases, risks may be significant, especially if groundwater tables rise, with serious public health implications. In contrast, both declining water availability and increased flooding will pose major risks to sewerage and septic systems relying on water, although their potential adaptability is higher, at least with utility backstopping.
5. Safe and efficient management of water supply and sanitation systems	Support Parties and other States to ensure safe an efficient management of water supply and sanitation services by strengthening national capacities regarding sustainable water resource management and scaling up risk-based management approaches, including consideration of the impacts of water-related natural disasters on human health and the environment	Reliable data, including evidence of observed and projected climate impacts, how the most vulnerable are affected, and critical reflection are crucial for making decisions about where to invest, how to sustain and improve water and sanitation services, and for understanding which policies and strategies work. This is especially necessary for adaptation and mitigation in the water and sanitation sector, but there remains a widespread lack of capacity for monitoring, inconsistent or fragmented gathering of data, and limited use of information management systems, which have been found to impede effective decision-making in sector planning, resource allocation and policy development. Developing and strengthening a platform for information sharing and mutual accountability requires an inclusive system for measuring sector performance against nationally established goals and targets, including those related to water and sanitation that are set in climate adaptation and mitigation strategies. As mitigation and adaptation to climate change continue to be tested and scaled up in the water and sanitation sector, a framework that enables multi-actor involvement in a structured process of knowledge creation, transfer and mobilization is vital. This Programme area is already undertaking activities, such as promoting climate resilient Water Safety Planning and promoting Sanitation Safety Planning as a tool to ensure safe sanitation and reuse practices in response to for example, water scarcity and drought. A holistic approach to water security must be taken by ensuring availability, accessibility, water quality, safety, disaster preparedness, proper governance and ecosystem health.
6. Equitable access to water and sanitation: translating into practice the human right to water and sanitation	Support implementation of the Protocol's requirement to ensure access to water and sanitation for all, including those suffering a disadvantage or social exclusion (article 5) and, thereby, the progressive realization of the human rights to safe drinking water and sanitation.	The most at risk and least able to deal with the impacts of climate change tend to be the most vulnerable populations. Many of the region's most at risk of droughts and floods already have low levels of access to sanitation and water. Aligned with on-going work withing this Programme Area, an important consideration to support the elimination of inequalities and build climate resilience is that climate change risks are assessed and mapped and this information overlaid with the locations of disadvantaged communities and low levels of access to water and sanitation. Such mapping should reveal "hot spots" of high climate risks linked to poverty and low levels of water and/or sanitation coverage and needs to be used to set or update priority adaptation interventions, both within climate and water-sanitation agendas, and reinforce advocacy efforts.

7. Increasing resilience to climate change	Strengthening communities' resilience to water-related disasters and other climate change induced effects. This programme area specifically focus on building awareness, evidence and capacities in addressing issues of extreme weather events, water scarcity and wastewater reuse in agriculture, including addressing the broader water resource management context.	Previous work on this Programme Area include the development of the Guidance on water supply and sanitation in extreme weather events (UNECE-WHO 2011). The document recalls the basic scientific findings, provides advice on communication issues, addresses the vulnerability of coastal areas and bathing waters, discusses the impact on human health, places extreme weather events in the context of water safety plans and formulates advice for adaptation measures for water supply and sanitation services during such events. Although the document is almost 10 years old and important climate global processes and frameworks have come to place since, the technical guidance provided remains mostly valid today. Later on, the workshop "Water scarcity: taking action in transboundary basins and addressing health impacts" took place in December 2017 with more than 140 participants from all over the world. The theme drew together expertise and experience under the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) and the Protocol. Currently this Programme Area is expected to develop capacity and promote good practices on building climate resilience of drinking water supply and sanitation services. This includes the organization of a strategic round table on climate resilience of drinking water supply and sanitation services in the pan-European region (to which this Note serves as background). This is expected to be done in coordination with programme areas 4 (Small scale water supplies and sanitation) and 5 (safe and efficient management of water supply and sanitation systems).
8. Assistance to support implementation at the national level	Assisting Parties and other States in securing government commitment and ownership regarding accession to the Protocol, and providing support to setting of targets, establishing action plans and implementing measures to achieve them by providing, upon demand and pending availability of resources, tailor-made support at the national level.	The institutions working with water and sanitation need to have the capacity to address the integration of climate change adaptation, mitigation, and risk reduction in the sector and the ability to look at how water and sanitation connects to other sectoral plans. There is a need for working more closely with the ministries or departments of local government to promote information-sharing and capacity-building at local level within government on climate adaptation and mitigation initiatives in the water and sanitation sector. At the same time promote bottom-up informed policies so that local approaches for adaptation to climate change are considered in national adaptation plans (NAPs) and mitigation processes, as well as water and sanitation sector strategies. Creating stronger local structures to respond to demands from specific climatic contexts and allocating resources that are specifically aimed at fostering climate change adaptation and mitigation. Within this Programme Area it would be important to highlight the opportunity to build hand-on capacities in countries.
9. Compliance procedure	The Compliance Committee will: perform its activities as set out in decision I/2 of the Meeting of the Parties on compliance; monitor and facilitate implementation of and compliance with the Protocol.	The Compliance Committee oversees implementation, including with regard to target setting and periodic reporting. Also, under the Consultation process the Committee provides advice on complying with the Protocol provisions, and will keep in mind water and sanitation climate resilient aspects (within its competence and technical knowledge of Committee members).

3. HOW THE PROTOCOL SUPPORTS GLOBAL CLIMATE FRAMEWORKS

The Protocol is a powerful instrument for promoting and operationalizing the achievement of the 2030 Agenda and its Sustainable Development Goals (SDGs) in the pan-European region. Indeed, it has placed the region on track by promoting the integration of policies in a holistic and preventive approach to achieve safely managed water and sanitation services and universal and equitable access for all, across all settings.

While the Protocol specifically focuses on SDGs 6 and 3, it further supports the implementation of other Goals and targets. Given that the impacts of climate change are deeply linked to water (for example, floods, storms, and droughts), mitigation and adaptation measures need to include water and sanitation-based interventions. Water is also a strategic means of adaptation and mitigation for managing and reducing risks of climate change across sectors. Therefore, the Protocol can play a key connector role among SDG 3 and 6 and SDG 13 that aims to "Take urgent action to combat climate change and its impacts". This further aligns with the Sendai Framework's targets related to improving the disaster resilience of new and existing water infrastructure to provide life-saving essential services during and after extreme events (Target (d) and Priority 4).

The table below presents connecting areas of on-going or potential support between the Protocol and the SDG 13 targets.

Table 3. Protocol support areas for the achievement of SDG 13 targets

SDG 13 Targets		On-going and potential Protocol support to SDG 13 Targets
13.1	**Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries**	• Protocol related targets to expand and upgrade water supply and sanitation infrastructure and services are expected to consider the need to ensure resilience to climate related risks. • Resilient water and sanitation systems are expected to be planned to contribute to build community resilience and increase adaptive capacity to climate change.
13.2	**Integrate climate change measures into national policies, strategies and planning**	• The Protocol promotes the identification of climate risks to the water supply and sanitation sector so that they are addressed in sectoral national and subnational policies, strategies and plans • Targets set under the Protocol on water and sanitation are expected to contribute to a carbon neutral sector using renewable energies, increasing energy efficiency, and recovering energy from waste.
13.3	**Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning**	• The Protocol supports capacity development and promotes good practices on building climate resilience of drinking water supply and sanitation services, including preparing for and responding to extreme weather events. This includes the organization of a strategic round table on climate resilience of drinking water supply and sanitation services in the pan-European region (in coordination with programme areas 4 and 5). • In cooperation with the Water Convention and different programme areas, the Protocol could promote stakeholder discussions and facilitate workshops on climate resilience water and sanitation and the links to water scarcity and transboundary basins.

13.A	**Mobilizing jointly $100 billion annually to address the needs of developing and fully operationalize the Green Climate Fund**	• The Protocol can support capacity building of water and sanitation stakeholders on climate financing and eventually could play a role on the development of proposal to address the current climate financing gap in the area of water/sanitation linked to health.
13.B	**Raising capacity for effective climate change-related planning and management**	• The Protocol supports water and wastewater operators in strategic planning for ensuring climate resilience, including through supporting the implementation of Water Safety Planning and Sanitation Safety Planning, and on the use of Climate Risk Informed Decision Analysis (CRIDA methodology). • A Pan-European Water and Sanitation Framework for climate resilience could be developed, within which capacity building support and implementation initiatives in the Region could be part an integral part.

The Paris Agreement adopted under the United Nations Framework Convention on Climate Change (UNFCCC) entered into force in 2016. It addresses the need to limit the rise of global average temperature to well below 2 degrees Celsius above pre-industrial levels by the end of the century, as well as the need to adapt to the impacts of climate change.

The implementation phase of the Paris Agreement focuses on Parties working to define and enact their Nationally Determined Contributions (NDCs). These, together with other key national and multisectoral strategies such as the National Adaptation Plans (NAPs), and National Communications are a powerful framework for laying out priorities for climate action, with the potential to guide mitigation and adaptation interventions within the water and sanitation sector. They also provide a basis for investment plans that integrate climate vulnerability and resilience in the broader context of the SDGs and the Sendai Framework.

Adaptation initiatives related to water management are included as a priority in many NDCs and NAPs. Yet, governance mechanisms and methods for integrating water and climate are absent, and the interface of drinking water, sanitation and health is worryingly not being addressed in most cases. Here, the Protocol can play a key role as its target-setting mechanism offers by its own nature an accountability framework at national and international level. It is at the same time a useful tool for planning adaptation to climate change, requiring the establishment of an intersectoral coordination mechanism, broad participation, and an analysis of gaps, development of scenarios and prioritization of measures based on development choices. Furthermore, activities under the Protocol´s programme of work promote the implementation of national targets and can provide a regional platform to facilitate exchange of experience and good practices on the bridging water, sanitation and health goals with climate goals and commitments. To start with, the Protocol can support the development of a menu of options for inclusion of water, sanitation, and health in NDCs and NAPs. Support can be provided as well to ensure that national (and sub-national) water supply and sanitation strategies integrate a clear climate rationale and risk analysis.

In relation to regional policies, the Ostrava Declaration on Environment and Health (2017) calls for advancing Protocol implementation. In turn, Parties to the Protocol can capitalize on the national targets and action plans set under the Protocol when developing and implementing national portfolio of actions on environment and health under the Declaration.

DISCUSSION POINTS FOR THE STRATEGIC ROUNDTABLE

With the aim of developing capacity and promoting good practices, the joint secretariat of the Protocol, provided by UNECE and WHO/ Europe, is planning to convene a strategic roundtable on increasing resilience to climate change in the pan-European region, to which this Note serves as a background.

In this context, the chapters above provide discussion points on how the Protocol can support establishing climate-resilient water and sanitation services and strengthening climate considerations in water and sanitation policy-making.

Potential topics for discussion at the strategic roundtable are as follows:

- What is the experience of the pan-European countries with climate change? What challenges are most pressing?
- How to strengthen climate sensitive target setting under the Protocol?
  Note: roundtable participants could be asked to discuss and populate target areas using Table 1 of this Note as a reference.
- How to strengthen climate change considerations across technical areas under the Protocol programme of work?
  What activities/guidance would be useful developing under the Protocol in the future? What is the added value of the Protocol in this area (e.g. strengthening intersectoral cooperation?
  Note: this discussion could be linked to the integration of climate change and resilience in the relevant programme areas. Table 2 of the Note could serve as a discussion point and reference.
- In the context of the Protocol, what is the role of civil society, the private sector and academia in supporting capacity-building and promoting good practices establishing climate-resilient water and sanitation services?
- How can the Protocol support strengthening climate considerations in water and sanitation policy-making and help building climate-resilient water and sanitation services?
- How to further integrate Protocol with global and regional climate frameworks and strategies? Examples of such integration. What activities or guidance would be useful to support such integration?
  Note: Table 3 of this Note could serve as a discussion point and reference.

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