United Nations ADVANCE UNEDITED VERSION A/CONF.240/2023/5

Distr.: General
(31 January 2023)

Original: English

2023 United Nations Conference on the Midterm Comprehensive Review of the Implementation of the Objectives of the International Decade for Action, "Water for Sustainable Development", 2018–2028

New York, 22 March –24 March 2023

Interactive dialogues

Interactive dialogue 2: Water for Sustainable Development

Concept paper prepared by the Secretariat

Summary

The present paper was prepared pursuant to paragraph 9(d) of UN General Assembly resolution 75/212, in which the Assembly requested the Secretary-General of the 2023 United Nations Conference on the Midterm Comprehensive Review of the Implementation of the International Decade for Action, "Water for Sustainable Development", 2018-2028 (hereinafter: UN 2023 Water Conference) to prepare concept papers on each of the themes of the interactive dialogues, taking into account the relevant water-related processes of the Assembly and other possible contributions. The present paper concerns interactive dialogue 2, entitled "Water for Sustainable Development: Valuing Water, Water-Energy-Food Nexus and Sustainable Economic and Urban Development (SDG 6.3, 6.4, 6.5 and SDGs 2, 8, 9, 11, 12)." This paper is structured along the three main topic areas of the dialogue noted above.

I. Introduction[1]

1. Water is a key socio-economic driver for sustainable growth, livelihood, justice, food security and labour. Access to clean and sustainable source of water is currently gravely imbalanced. But without equitable and secure access to water for all, there can be no sustainable development. Water availability is a global challenge, yet one whose solutions must be understood and implemented at a local, national, regional and global levels.

2. Globally, over 2 billion people live in countries that experience high water stress. As water becomes scarcer and more polluted, it becomes more valuable and thus subject to competitions and conflicts among uses and users. Today, more than 50% of the world's cities and 75% of all irrigated areas are experiencing water shortages on a recurring basis. Water scarcity data indicate that trends of increases in water scarcity are widespread and continuing, including in transboundary settings. Severe water scarcity is also inducing more desertification and increases migration from rural areas to urban areas with impacts on arable land loss and farming. This influx is a challenge for local authorities to absorb.

3. The Sustainable Development Goals as enshrined in the 2030 Agenda for Sustainable development are intricately linked to the access to water, to the reliability of water supply, to impacts upon shared water resources, and innovations to support co-management of shared water resources in a way that does not diminish the ability of current and future generations to benefit from this fragile resource. In the sections below, the paper emphasises the ability to value water resources and services meaningfully, the ability to successfully apply the synergies inherent in the water-energy-food-ecosystems nexus, and the ability to consider the role of water access and management for sustainable economic and urban development as key to addressing the international community's challenges in the water sector. The following focuses on these issues through the lens of the accelerators of the SDG 6 Global Acceleration Framework.

II. Valuation of water resources and services

4. How water is valued affects the way in which governments, businesses and the public use, conserve and manage water. "Valuing water" and "water valuation" are not the same thing. Valuing water cannot be limited to economic values. Economic theory asserts that the value of a good is determined by scarcity. Water is currently used as if it is limitless, but freshwater is scarce, and becoming scarcer. A review of the economics of water helps us to determine the cost of inaction to society, and to justify concessional financing for better development outcomes. The objective of valuing water is not to reduce access by society's poorest: it is the opposite. Valuing water is not merely a financing issue: valuing water is also about use, water protection and the allocation of water when it is scarce. The Valuing Water Initiative[2] calls for water to be prioritised in decision making through the application of the five Valuing Water Principles[3] to encourage governments, industries and civil society to bring about the systemic change required to understand, value and manage water.

[1] This Concept Paper has benefitted from contributions from Member States, UN system and a diverse group of stakeholders. See https://sdgs.un.org/conferences/water2023/documentation and https://www.un.org/sites/un2.un.org/files/final_water_consultation_report_19_oct.pdf

[2] See https://valuingwaterinitiative.org/

[3] (1) Recognize and embrace water's multiple values to different groups and interests in all decisions affecting water; (2) Reconcile values and build trust – conduct all processes to reconcile values in ways that are equitable, transparent and inclusive; (3) Protect the sources, including watersheds, rivers, aquifers, associated ecosystems, and used water flows for current and future generations; (4) Educate to empower – promote education and awareness among all stakeholders about the intrinsic value of water and its essential role in all aspects of life; and (5) Invest and innovate – ensure adequate investment in institutions, infrastructure, information and innovation to realize the many benefits derived from water and reduce risks.

5. Water's current price rarely reflects its economic, social or environmental value or the true costs of treatment and distribution. Low water prices result in inefficient use and reduced provision and expansion of services, particularly for the poor, making the sector less attractive to investors and inflicting high costs on the economy, society and environment. Governments play a significant role in the creation and regulation of water pricing systems. Tariffs are essential, but are not the only pathway to recovering costs, addressing affordability and managing water conservation. To maximize their potential, they must be well designed, complemented by appropriate instruments, adequately regulated and understood by customers.

6. Other economic instruments, such as quotas and buy-back rights, present opportunities to influence users' behaviour in managing and conserving water. Developing a financially sustainable basis for the water sector requires establishing the appropriate balance and relationship between tariffs, taxes and transfers (the "3Ts"). Resistance to tariff reform is reduced by strong political leadership, improved service quality and increased stakeholder engagement. To properly value water, clear, honest and reliable data is needed which the sector is often lacking. Strong water rights regimes, inclusive social support programmes, and enforcement mechanisms need to be in place to support water pricing.

7. For too long, thinking on water has been polarized between those whose rights-based approach to the issue has set them in perceived tension with those who argue that without accurately pricing the cost of collecting, maintaining and distributing water, communities cannot fund the vast improvements required by the ageing infrastructure. The two approaches can and must be reconciled through a focus on equitable outcomes through government policies and incentives to ensure no one is left behind.

8. Amidst increasing scarcity and unreliability in water as a resource, a diverse set of values drives the economic and financial considerations in water-related decision making. Water has multiple values: trade-offs inevitably arise and are best addressed via more robust measurement and valuation methods. Multi-value approaches to water governance require the active participation of a diverse set of actors, including those whose voices are not always heard.[4] This, in turn, enables stakeholder processes that recognize and reconcile a comprehensive mix of values, including benefit-sharing in water governance, tenure, as well as integrating ecological and environmental values into climate-resilient water management.

Financing for water services valuation

9. A key challenge before the water community is how to ensure that development, climate and biodiversity finance serve our water needs. Water must be affordable, but patterns of high wastage are not sustainable and must be incentivized to change. Thought leadership from government and development partners including the private sector, industry around circular ecosystems that will reduce water pollution, would be necessary. International and national financing institutions have a critical role to play in financing water for sustainable development.

10. There is a need to focus on enabling conditions necessary at national level to attract private finance in support of water investment. Such an enabling environment will combine water policies and institutional arrangements which include the broader policy framework for investment; capacity to develop projects, and an economy-wide water lens (making sure investments in other sectors contribute to the broader water agenda).

11. With additional financial commitments must come a rapidly scaled up pipeline of water investment opportunities that contribute to data and information; capacity development; innovation; and governance. Intensified focus on increasing the supply of financial resources (public and private) is much needed and would be a welcome development. Here, it is important to acknowledge the breadth and diversity of private sector involvement in the water sector, whose role goes beyond financing through to carrying out works on the ground. There is a need to increase due diligence around

[4] United Nations, The United Nations World Water Development Report 2021: Valuing Water. UNESCO, Paris

environmental and social safeguarding when seeking out finance in support of water projects. Credit risks and water resource protection need to be more fully understood and supported by those issuing credits for all investments. Anchoring water financing into an integrated approach allows discussion of water in the context of trade within and between countries.

How to close the water financing gap

12. Though estimates vary, financing needs in the water sector are colossal, at between US$ 182 to US$ 664 billion annually[5] - a deficit that comprises shortfalls in water supply and sanitation (US$ 116–229 billion per year); flood protection (US$ 23-335 billion per year); irrigation (US$ 43–100 billion per year); and financing of water resource management implementation – crucial to SDG indicator 6.5.1 – where 60% of countries report that they have little or no active fee systems in place to levy financing for water resources management. Estimates suggest that US$ 6.7 trillion is needed by 2030, and US$ 22.6 trillion by 2050 to achieve Sustainable Development Goal 6.[6]

13. There is also much to be done on the demand side of the equation. To become more credit-worthy and able to tap into new sources of investment, water service providers - whether utilities, irrigation agencies, local or national governments - need to become more technically and financial efficient. Governance arrangements need to become clearer and more transparent. Similarly, economic regulation for water services has a role to play to enhance performance and the creditworthiness of service providers.

Economic regulation for water services

14. Incentives to improve performance and attract private finance require economic regulation for water services. Economic regulation for water services can i) set performance standards, ii) monitor and compare performance, iii) provide incentives for better performance (through tariff policy, privileged access to public finance, or else), and iv) promote transparency. This can include incentives to agglomerate service providers to reach economies of scope and scale.

Closing the financing gap: the Continental Africa Water Investment Programme

Formally launched during the 9th World Water Forum in Dakar (March 2022), the International High Level Panel on Water Investments for Africa was established to help close the gap on water financing in Africa. Its purpose is to drive global political mobilization to meet Africa's socio-economic needs, including those related to SDG 6 on water. It is also expected to address the twin challenge of climate change and the COVID-19 pandemic. The Panel supports implementation of the Continental Africa Water Investment Programme (AIP), which aims to leverage at least US$ 30 billion per year by 2030 and close the existing investment gap in the water sector, estimated at between US$ 11-20 billion dollars per year.

Data and information for water services valuation

15. Data generation, validation, standardization and information exchange across sectors make an important contribution to water services valuation, not least by building mutual trust and confidence in leaders seeking to make informed decisions around security of access to water. High standards of data gathering, validation and information exchange ensure that high quality information on SDG indicators is shared and can be accessed easily by any decision maker. The creation of incentives for data sharing could usefully be linked to access to financing. There is work to be done in terms of data

[5] Rozenbery, J. and Fay, M. (2019) *Beyond the Gap: How Countries Can Afford the Infrastructure They Need While Protecting the Planet*

[6] OECD (2022), Financing a Water Secure Future, OECD Studies on Water, OECD Publishing, Paris

shared among UN agencies. Data on groundwater lags behind the quality of data available in other parts of the water sector.

Capacity development

16. Capacity development must play a central role in building global understanding that water is a finite, limited, fragile resource in need of pragmatic and equitable approaches to value water services. Training for professional water resource managers, including those in industry, across sectors including energy, agriculture, municipal and environment authorities, stakeholder groups, decision makers and the public sector will benefit from curricula designed specifically for their needs and in their own languages. This capacity development will in turn build an enabling environment for innovative practices in water services valuation.

Innovation

17. Governments alone cannot provide innovation. The private sector plays a particularly fundamental role – including smaller enterprises. Innovation emerges out of complex interactions between the public and private sector, shaped by institutional frameworks to support human capacity development, research and development, and business support.

Governance

18. Creating enabling environments for continued innovation, adjustment and recalibration is a key catalyst for transformative change. This includes exploring how governance structures and processes can identify, implement and scale innovation. Governments can ensure that new technologies support local water management priorities in respect of water services valuation— and contribute to global solutions.

19. Competition for water resources is intensifying due to population growth, economic development, degraded water quality and climate change. Growing pressures are rendering existing inefficiencies in water allocation regimes still more costly: conversely, water allocation regimes that perform well and can adapt to changing conditions are now much prized.

20. Well-designed water allocation regimes contribute to multiple water policy objectives: generating economic efficiency, by allocating resources to higher value uses as well as contributing to innovation and investment in water use efficiency; environmental performance, by securing adequate flows to support ecosystems services; and equity, by sharing the risks of shortage among water users fairly.[7] Consistency, however, across geographical scales remains a challenge for policy makers. What may be sound water management in a sub catchment may be suboptimal in the larger basin.

21. The water sector is generally under-funded, exacerbated by low water tariffs: as a result, investment in innovation for water is low. In the period 2000-2013, global investment in innovation in clean energy was approximately US$ 139 billion, compared to US$ 8 billion in innovation in the water sector.[8]

22. Well-designed economic and environmental regulation can be an important driver of investment in water infrastructure, generating new markets for innovations like fit-for-purpose re-use of urban wastewater and nutrient reclamation for irrigated agriculture and forestry. Regulations can increase investment in secure means of accessing water and the demand for treatment technologies. Regulations that impose limits on water extraction can generate increased investment in water conservation and alternative sources of water supply (such as wastewater reuse, desalination and nonconventional water sources) along with demand for related technologies. At the same time, certain regulatory barriers

[7] https://www.oecd.org/environment/resources/Water-Resources-Allocation-Policy-Highlights-web.pdf

[8] Cleantech Group (2014) “i3 Quarterly Innovation Monitor: Water and Wastewater” Cleantech Group, San Francisco, London, New York

currently exist that inhibit investment, such as a lack of a clear regulatory framework for wastewater reuse.

23. Innovative thinking is now needed to decouple the idea of water valuation from the pervasive but outdated narrative that water valuation will lead inexorably to water privatization. Water is perhaps the most vital of our global commons: hostility to any perception of its commercial alienation from those in need is completely understandable. Economic valuation of water services is key to *correcting* the water access imbalance. Innovative approaches both to correct this suspicion of the motive behind valuation; and to better articulate, measure and appreciate the value of ecosystem services and water is needed.

III. **Integrated management of the water-energy-food nexus**

24. Water, food and energy form a nexus at the heart of sustainable development. Agriculture is the largest consumer of the world's freshwater resources, (over 70% of global freshwater withdrawals) and water is used to produce most forms of energy. Demand for all three is increasing rapidly, driven by a rising global population, rapid urbanization, changing diets and economic growth. Rising incomes in many countries is boosting demand for more water-intensive meat and dairy – displacing mainly starch-based diets. To withstand current and future pressures, governments must ensure integrated and sustainable management of water, food and energy to balance the needs of people, nature and the economy. As water becomes more scarce and stretched, its ability to support progress in several of the SDGs, particularly on poverty, hunger, sustainability and the environment, is being reduced.

25. Food production and energy are highly water intensive. Agriculture is also the largest employer of the world's poor. Approximately 75% of the extreme poor live in rural areas and depend on agriculture for their livelihoods and food security, broad-based rural development and the wide sharing of its benefits are the most effective means of reducing poverty and food insecurity.[9] Responsible agricultural water management, including climate resilience and pollution control is a major and necessary priority for future global water and food security. More than one-quarter of the energy used globally is expended on food production and supply. The vast majority of energy generation is water intensive, such as its use in coal-fired power plants and in nuclear reactors, and in bio-fuel crop production.

26. Over the past decade, as a complementary framework to the water-energy-food nexus, the ecosystem element has been added to the three resources, therefore creating the water–energy–food–ecosystem (WEFE) nexus. This method has risen to prominence as a systematic approach to a greater understanding of the interconnectedness and trade-offs given natural resources and human activities depend on ecosystems. Effective cross-sectoral consultation mechanisms, such as the WEFE framework, are needed at local, national, and global scales to ensure the development of concerted efforts. Understanding and harnessing the potential of the WEFE nexus is key to reconciling often-competing sectoral objectives and attaining sustainable development. WEFE has emerged as a powerful concept to describe and address the complex and interrelated nature of global resource systems needed for humankind to achieve social, economic and environmental goals.[10]

27. The WEFE approach integrates across all sectors, and its holistic vision of sustainability aims to attain a balance between the different goals, interests and needs of people and the environment. For instance**,** efficiency measures along the entire agri-food chain can help save water and energy, such as

[9] 2021 FAO State of Land and Water for Food and Agriculture (decadal report) https://www.fao.org/land-water/solaw2021/en/

2020 FAO Overcoming Water Challenges in Agriculture, State of Food and Agriculture https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1333955/

[10] Koo-Oshima and Gillet, 2022

precision irrigation based on information supplied by water providers, and protection of ecosystems alongside agriculture and energy production can ensure environmental integrity.

28. As a transformative approach, the WEFE nexus encourages restructuring the network of decision-making and partnerships to focus on inclusion and equity among partners.[11] To that end, successful partnerships can be built on existing institutions (e.g., river basin organizations, WEFE resource user associations) and their knowledge, capacity, competencies and social capital.

29. Governments must increase renewable energy sources. There needs to be much more support for the development of less water-intensive renewable energy, such as hydropower and wind. Geothermal energy has great potential as a long-term, climate independent resource that produces little or no greenhouse gases and does not consume water.[12] There are significant parallels between equitable access to sustainable energy and equitable access to sustainably managed water: in its rapid shift from centralized to decentralized models, water services mimic the pattern of renewable energy infrastructure and both must also overcome the challenge of reaching decentralized populations.

30. The relationship between water governance and sustainable economic development calls for an integrated consideration of patterns of sustainable production and consumption. Integrated Water Resource Management (IWRM) is the key to successful governance for water services valuation, the WEFE nexus and sustainable economic and urban development. IWRM occurs when multiple sectors work together to manage water demand in a way that engages with differing sets of values and meets everyone's needs, without depriving anyone – including nature – of access. IWRM is a tool for managing land and water resources to maximize economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems.

Financing

31. Financing alone is insufficient to achieve our goals. Successful investments in the water sector require a robust enabling environment with effective policies, sound regulation, evidence-based operational reforms, and well-governed and accountable institutions. To achieve sustainable development, stronger water management, sector reform and greater efficiency and coherence across the WEFE nexus is essential. A fundamental shift is needed to adopt a cross-sectoral and interdisciplinary approach to reach the Sustainable Development Goals of Agenda 2030. For instance, additional finance is needed to minimize water demand in agriculture while also supporting energy conservation to reduce overall resource demands.

Data and information

32. There is an important role for data and information to play in support of the WEFE nexus. The first step is a stocktake of a country's sources of water - rivers, glaciers, cryosphere, groundwater supplies and hydropower capacity – and a full understanding of how these resources are distributed geographically and temporally. Next comes an analysis of water needs (water to fuel the ecosystem, water for agriculture, water for hydropower/energy, and for municipal and industrial use) and consideration of how to meet all of these needs while retaining water downstream for transboundary use.

[11] FAO has developed its own conceptual approach to the water–energy–food (ecosystem) nexus. The approach distinguishes between the resource base and the different goals and interests that are to be achieved with the same, but with limited resources. It is about understanding and managing these different resource user goals and interests, while maintaining the integrity of ecosystems. Effective partnerships are key in nexus-based decision-making, with structured stakeholder dialogues in managing the nexus through evidence, scenario development and response options.

[12] Koo-Oshima and Gillet, 2022

33. Water quality and groundwater data remain sparse, especially at the global level, due in large part to weak monitoring and reporting capacity.[13] Information about water supply and use is vitally important to national governments, which need reliable and objective information about the state of water resources, their use and management.

34. National-level water data collection and analysis needs further investment to enhance reliability and reach: the plethora of different institutions involved at the national level in water-related data collection, standardization and publication is a key challenge as countries work to improve accounting of the WEFE nexus. Targeted funding for national water data at all steps, from generation to sharing, would greatly improve SDG and general water resources monitoring. In addition, there is a need to collect and disseminate more regular and disaggregated data (gender, age, sources, sectors, subnational, etc.) to support the formulation of responsive policies and programmes to ensure no one is left behind.

35. Recent developments in cloud storage, application programming interfaces (API) and globally agreed metadata classification such as the Statistical Data and Metadata Exchange (SDMX) ease such water data-sharing and understanding between each sector of the nexus, through standardization and interoperability, with the goal of data FAIRness – data that is Findable, Accessible, Inter-operable and Reusable.

Capacity development

36. Capacity development for the WEFE nexus requires strong local buy-in to integrate more sustainable water management practices, in particular for food production. Innovative technologies, responding to the WEFE challenges such as solar-power irrigation, bioenergy crops or crops reducing methane emissions, or multiple use schemes should be introduced with capacity development not only at technical, but also institutional level to fully unlock their respective cross-sectoral benefits, explicit their trade-offs and avoid unintended consequences of large-scale development.

37. Partnerships for capacity development are also to be broadened to strengthen and coordinate governance across water, energy, food and ecosystems, including land, forestry, livestock, aquaculture and biodiversity while ensuring livelihoods, food and nutrition security, gender and social inclusion. WEFE capacity development strategies would greatly benefit from identification of interconnections and synergies for the WEFE nexus from Indigenous and traditional cultures.

Innovation

38. Agricultural water use must be highlighted, including crop and cropping patterns adaption, agro-ecology approaches, and the use of digital and remote sensing data to monitor on-farm water management and basin-wide water use since agriculture is a land-based activity.

39. It is worth noting that efforts to increase water savings by introducing more efficient on-farm irrigation technology will not lead necessarily to real water savings, as irrigating farmers may opt for increasing the area irrigated if new technologies allow them to use less water (Jevon's paradox[14]) or increase water productivity. Thus, adequate water management policies, including water accounting and functional water allocation regimes, and enforcement of the water use cap is required along with efficiency and productivity improvements to lead to real water saving at the basin level.

[13] WWDR 2022 and 2023

[14] The Jevons Paradox states that, in the long term, an increase in efficiency in resource use will generate an increase in resource consumption rather than a decrease. Perez-Blanco (2020) conducted a comprehensive review of the theoretical and empirical literature on water conservation technologies that includes more than 230 studies. The review concluded that if the ultimate objective is water-saving (and possible transfer to other users), it is essential to concomitantly implement water demand management policies, including water accounting and functional water allocation regimes, and enforcement of the water use cap.

40. Policymakers need to pilot, test then upscale and replicate transformative applications of water management systems that fully incorporate all elements of the WEFE nexus – including adaptation to meet the mounting pressures on and competition over water resources from the expanding needs of agriculture.

IV. Sustainable Economic and Urban Development

41. Universal and equitable access to safe and affordable drinking water has not been achieved, and water infrastructure and governance in many parts of the world is no longer fit for purpose to make such a goal reality. Water-related risks demand mitigation: the risk of too much water; too little; too polluted; and risks to the resilience of freshwater ecosystems. The impacts of climate change compound the urgency and scale of the task before us.

42. Water scarcity continues to drive migration – including climate induced migration - and generate conflict. The need to achieve sustainable production and consumption patterns for water has never been more acute. It is only by incorporating water valuation into applied integrated water resource management that a path to a more equitable distribution of water resources across users and across time and to meet the growing needs of different users can be found.

Water and urbanization

43. By 2050, 70% of the global population is expected to live in cities.[15] Urban planning will need to integrate system-wide water management approaches to limit the footprint that cities have on water quality, quantity, and on energy and agri-food systems, including food loss and waste. Unmanaged urbanization can result in cities that perpetuate environmental degradation, poverty, inequality, informality, pollution and unemployment and encroach on fertile agricultural lands and biodiversity, while releasing unmitigated pollutants into fragile water supplies. By contrast, multi-level governance and integrated regional and urban planning can conserve and rehabilitate water resources, water storage and retention and promote investment in climate resilient infrastructure that supports stormwater management and disaster mitigation, while also contributing to the blue economy.

Water pollution

44. Untreated wastewater results in poor water quality and stalls economic progress, reduces food production, spreads disease and limits human potential. Recent research shows that upstream pollution lowers growth in downstream regions; and reveals that some of the most ubiquitous contaminants of water, like nitrates and salt, have wider and deeper impacts – including stark implications for crop yield and food security – than have previously been acknowledged.[16] Poor wastewater management is making significant contributions to GHG emissions and climate change. Globally, the most prevalent water quality problem is eutrophication, a result of high-nutrient loads, due to agriculture. Once water is contaminated, it is difficult, costly, and sometimes impossible to remove the pollutants. Confronting the scale of the world's water quality challenge will be key to its resolution, which will in turn require a paradigm shift that combines newer technologies and smarter policy-making.[17]

Nature-based solutions

45. Nature-based solutions are an important part of sustainable economic development, and to a perhaps unexpected extent hold high relevance for urban development planning as well.[18] A key

[15] United Nations, Department of Economic and Social Affairs, Population Division (2019). World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420). New York: United Nations.
[16] Quality Unknown: The Invisible Water Crisis
[17] https://openknowledge.worldbank.org/handle/10986/32245
[18] The European Commission defines green infrastructure as a particular nature-based solution (NBS) that can be applied to flood risk management. It is defined as: "A strategically planned network of high quality

governance opportunity is collaborating with urban planners to take into consideration, natural ecosystems, such as in the development of climate resilient infrastructure and sustainable drainage systems (SUDs). Governments should harness the power of nature instead of allowing its destruction and degradation in the pursuit of food and energy. Examples of green infrastructure.[19] like land dams to capture runoff in arable fields or planting forests to protect soil and assist groundwater recharge, demonstrate of the creation of a more sustainable water-food-energy nexus and a sustainable economy.

Climate change

46. Climate change adds to pre-existing challenges by increasing the variability and unpredictability of precipitation. Effective emission reduction strategies require a coordinated approach for land and water management, whilst also considering factors such as disaster risk reduction, biodiversity recovery, and sustainable community livelihoods.

47. It would be important to coordinate and strengthen joint water and climate governance to mainstream fresh-water concerns in all climate mitigation planning and action. To do so, policymakers need to embrace an integrated approach to climate mitigation, particularly when setting Nationally Determined Contributions (NDC). This would help facilitate participation of all relevant ministries and other actors and move away from siloed problem solving.

48. Furthermore, it would be crucial to adapt water and climate governance frameworks and instruments to different contexts. For instance, the provision of drinking water and sanitation services require decentralised solutions resting on local governance while, the management of aquatic environments and forests, require basin-level governance. Governance frameworks and instruments need to be adapted to fit local circumstances. Better coordination and collaboration between stakeholders, sectors and transboundary basins will help address trade-offs.

Financing for sustainable economic and urban development

49. Approximately 35% of treated water is currently lost in urban water systems.[20] Roughly 45 million cubic meters of water are lost daily in the developing world, with the global estimated of physical water losses at around 32 billion cubic meters each year.[21] Water utilities suffer from the huge financial costs of treating and pumping water only to see it leak back into the ground, and the lost revenues from water that could have otherwise been sold.[22]

50. All countries face a growing funding gap as they try to keep up with the rehabilitation, operation, and maintenance of again water infrastructures. Public spending is the main source of spending in the water sector, constituting roughly 86% of the sector's total spending, followed by Official Development Assistance to developing countries and state-owned enterprises at a distant 7 and 6% respectively, while the private sector accounts for only 2% of total spending.[23] Investments are needed not just for water supply and sanitation services, but for irrigation and integrated water resource management as well. Increasing financial support and creating new financial mechanisms to boost and sustain investment in water infrastructure are a part of the challenge (see paragraph 12). But a dearth

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natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings."

19 Green infrastructure "refers to the natural or semi-natural systems that provide services for water resourcesmanagement with equivalent or similar benefitsto conventional (built) "grey" water infrastructure." See UNEP, 2014. *Green Infrastructure: Guide for Water Management.*

[20] The International Benchmarking Network for Water and Sanitation Utilities (IB-NET), referenced in Kingdom, B, et al (2006) *The Challenge of Reducing Non-Revenue Water in Developing Countries, How the Private Sector Can Help: A Look at Performance-Based Service Contracting,* Washington, DC: The World Bank

[21] Kingdom, B. et al (2016) *What is non-revenue water? How can we reduce it for better water service?*

[22] *Ibid.*

[23] World Bank, forthcoming (2023), Public Spending in the Water Sector, Washington, DC: The World Bank

of bankable water infrastructure projects—with clearly defined revenue streams and viable business models—is a further obstacle.[24]

51. Investments in water management infrastructure, both natural and built, are needed to provide public goods, such as flood attenuation, drought mitigation, groundwater recharge, and bulk water supply for domestic purposes.[25] For instance, consistent strategies and data-informed tools for the prioritization of irrigation investments are required to maximize financial efforts and deliver the highest impacts. In addition, capturing increased land value around water canals, rivers and coasts is important for sustainable urban development.

52. Financing alone is insufficient to achieve our goals. Successful investments in the water sector require a robust enabling environment with effective policies, sound regulation, evidence-based operational reforms, and well-governed and accountable institutions. To achieve SDG 6, stronger water management, sector reform and greater efficiency is essential. In essence, service providers need to be more technically and financially efficient and policy, institutional and regularly arrangements need to be clearer and more transparent.

53. To increase and improve efficiency of spending in water sector requires making public sector water service providers financially sustainable and creditworthy. More specifically, this means addressing (1) improving the technical and financial viability of the providers, and (2) improving the governance and enabling environment comprising policies, institutional arrangements, and regulations (PIR). Water providers that collect only 70% of their allotted tariffs, or have non-revenue water rates of 40%, are simply not financially viable or creditworthy—they rarely attract sorely needed public finance, and they certainly are not attracting private finance. Moreover, such inefficiencies must be significantly reduced for climate mitigation and adaptation.

54. The private sector should be mobilized as a key partner in financing debt and equity, including commercial financiers and institutional investors. Investment priorities should be assessed strategically. Governments need to provide an enabling environment to build investor confidence. Investments could be prioritized to include those that strengthen energy efficiency by converting diesel to solar pumps and connecting households to existing transmission lines as short-term goals. Long term objectives would include large water or wastewater treatment plants.

55. Projects, investments and financing flows that are harmful to the water agenda should be actively discouraged. Further work with corporate entities – including making disclosure of impact on the water sector should be made mandatory. Collaborating with financial institutions to inform them of how water risks can affect them, individually or collectively would be an important area to pursue. Additional collaboration is required with standard setters, on due diligence and corporate accounting standards, and on the regulation of financial markets.[26]

56. A range of innovative data-led practices can be used to support interventions that pertain to water access, management and conservation for sustainable development of all sectors and domains. Water accounting and auditing (including water tenure) provide significant opportunities for the global

[24] OECD (2022) Financing a Water Secure Future, Paris: OECD Publishing.

[25] In the most recent SDG indicator 6.5.1 monitoring report, 35–40 % of countries reported that a limited amount of financing had been allocated for planned IWRM investments, with far less allocated for ongoing maintenance or sub-national investment projects.

[26] The **Water as Leverage** programme acknowledges that water is the leverage for best climate impact, but notes that "it takes millions to invest billions wisely": the programme invests those catalytic first millions with the goal of leveraging the investment necessary to implement catalytic projects that in turn leverage water for real urban climate resilience. The Programme aims to involve the international financial world, development banks and governments in the advancement of this new approach to create an inclusive and innovative pre-project preparation facility.

community of water stakeholders, to make substantial improvements in the availability, quality and application of information about water through data collection.[27]

57. Opportunities for progress in the generation and collection of water data at country level include the use of open-access tools and data portals, such as the use of earth observation satellites at local level; satellite remote sensing; advanced geospatial modelling and "big data" analytics via the FAO hand-in-hand initiative; Artificial Intelligence to augment near real time information in support of decision-making; stakeholder involvement via citizen science (enabling participative data collection, allocation regimes, and water tenure dialogue); the OECD's Water Governance and Indicator Framework for instance, enables coherence across sectors/actors on water use, equitable allocation and management; and early warning systems which are increasingly vital to the management of systemic, cascading and compounding risk.

Capacity development

58. The complexity of water issues as part of sustainable economic and urban development requires capacity development that is systemic, long-term, and forward-looking. This in turn requires local ownership if it is to be sustainable beyond any one initiative: it is an iterative process for lifelong learning which enables societal change. Capacity development is not "just training." With the rise in internet communication and coordination, the potential for making significant strides in capacity building are noteworthy and primed to advance. This will include capacity development in local languages in areas such as water quality monitoring, water quantity assessment, ecosystem roles, and climate change impacts and adaptation measures. This will also include developments of adoption of standards in measuring and monitoring that will allow for nationwide, regional, and global reporting in coherent and comparable ways. Capacity development is much needed by national and local authorities, not least to increase the creditworthiness of local authorities seeking to crowd in more financing.

59. Additional courses on water for sustainable economic and urban development are needed, as water is often taken for granted by those mandated with realizing sustainable economic and urban development. Open-source courses for IWRM and intersectoral water management must be built and shared on a wide range of topics including, inter alia: water resources economics, river system ecology, water diplomacy, water and gender, multistakeholder engagement in water resources, water demand management practices, the WEFE nexus, and more.[28]

[27] When United Nations member states adopted the 2030 Agenda, countries took responsibility for collecting and sharing indicator data and metadata on water for the purpose of global reporting. UN-Water established the International Monitoring Initiative-SDG6 in 2015 at the beginning of the 2030 Agenda for Sustainable Development. The overarching goal of IMI-SDG6 is to accelerate the achievement of SDG 6, by increasing the availability of high-quality data for evidence-based policymaking, regulations, planning, and investments at all levels. More specifically, IMI-SDG6 aims to: i) support countries to collect, analyse and report SDG 6 data, and ii) support policy-and decision-makers at all levels to use this data in a holistic manner. At the national level, IMI-SDG 6 also promotes intersectoral collaboration and consolidation of existing capacities and data across organizations.

[28] A prototype for this is UNDP's Cap-Net which has served as the global network for capacity development in sustainable water management over the past 2 decades. It is strategically positioned to bridge global expertise with local needs, and foster local authority partnerships towards universal access to basic services. Through its 23 networks with a footprint across 120 countries, close integration with Sustainable Development Goals and cross-scale approaches link local/community – national - transboundary water governance, Cap-Net's inclusive capacity development initiatives are able to support vulnerable groups to be active decision-makers.

IWRM capacity development – the IWRM Academy

A UNDP-GEF initiative under the Kura-River Basin project developed the training modules for capacity building at the IWRM Academy. This includes course in Georgian, Azerbaijani, and English, taught by top international experts in the fields of: Environmental Economics, Environmental Flow Methodology, Climate Change Adaptation for Water, Gender Mainstreaming in Water; River Basin Management Planning and the EU Directive; Hydro-economic Modelling; Hydrological Modelling; Monitoring for Regional and Transboundary Ground Water Management, with UNESCO IHP; ISO 17025 Laboratory Monitoring Standards; Pollution Abatement Plans; River Ecology; Waste Water Emissions Inventories; and, Environmental Inspection and Enforcement. An overview course on the Water Nexus is also included here.

Innovation

60. To achieve SDG 6 in the face of the growing water crisis, innovation and technology have a vital role to play in scarcity and safety, water efficiency, utility operations, monitoring and treatment, and data analytics.

61. Innovation in the clean water sector is already taking place.[29] There are many promising innovative technologies to help address the water crisis and contribute to achieving SDG 6, including new technologies for improved water management and protecting a resilient water supply; improved utility management; improved customer service and relationships; and reaching the unserved and underserved populations. A key target of this area of innovation is to improve the economic return per unit of water.

62. Water infrastructure development projects are notorious for a cycle of "build, neglect, rebuild." There is a need to break this wasteful and disempowering cycle. It is therefore essential to harness technology, resources and enhance capacity to help build resilience and sustainability into water infrastructure. Innovation can take place finding synergies between urbanization, water sources and systems through evidence-based spatial planning, enhancing urban metabolism. Innovative financing models for water and sanitation projects being certified for carbon credits could be explored,[32] offering small and medium-sized enterprises carbon credits opportunities to leverage finance for increasing access to safe water.

63. Moving past the barriers to disruptive technologies in the water sector will require engagement by policy makers across stakeholder, utilities, regulators, investors, industry and utility associations, technology providers, academia, and government at all levels. Water tariffs must be adjusted to reflect the realistic price of piped water delivery service and to encourage innovation,[30] and funding should be invested in research, testing and deploying new technologies. Several water utilities are innovating disruptive technologies, helping technology providers pilot potential solutions, and exploring opportunities to invest in innovations to make service more efficient, inclusive and participatory.

Conclusion

[29] The Water Resources Utility of the Future...Blueprint for Action. NACWA, WERF and WEF, 2018.

[30] In the UK, the Regulator (Ofwat)'s price review framework promotes innovation by providing early tariff determinations and financial and reputational benefits for companies that develop and implement new ways of working including the use of new markets; cooperating more effectively with third parties; and moving from successful pilots to swiftly embed best practice from the water sector and other sectors into their day to day business https://www.ofwat.gov.uk/wp-content/uploads/2017/12/Driving-innovation-in-water-FINAL.pdf)

64. Water valuation, the WEFE nexus, and sustainable economic and urban development are key components of a larger goal: equitable access for all to clean and sustainably managed water.

65. To succeed in the pursuit of equitable and sustainable water governance, it is important to explore fully the links between water, climate change and biodiversity loss. Water service providers need to be more technically and financially efficient in order to attract more public and private investment. Water service provision must be valued to halt the disastrous patterns of water wastage while ensuring equitable access to water for all. There needs to be support countries to generate and use the insights that data and information yield in pursuit of clean water and sanitation – because what is not measured cannot be managed. Capacity development and innovation will be key to finding new solutions and achieving impact at the scale needed, setting aside the conservatism that has historically characterized the water sector. The final piece of the water and sustainable development puzzle is governance. Acknowledging the multiple values of water in water governance enables stakeholder processes to recognize and reconcile a comprehensive mix of values, including benefit-sharing in water governance, as well as integrating ecological and environmental values into climate-resilient water management. Drawing on this fully-rounded understanding of the value of water, Integrated Water Resource Management is critical to successful governance for water services valuation, the WEFE nexus, and sustainable economic and urban development: a shared tool for managing land and water resources to maximize economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems. These are our tools available to confront the challenge of securing access to safe and well-managed water for all – a goal without which it is not possible to achieve sustainable development.

V. Recommendations

General

- With additional financial commitments must come a rapidly scaled up global pipeline of water investment opportunities

Valuing water

- The economic valuation of water services is key to *correcting* the water access imbalance. We need innovative approaches inform the international community the need for valuation; and to better articulate, measure and appreciate the value of ecosystem services and water.
- Governments must determine the cost of inaction on water valuation to society.
- Development banks, both domestic and international, have a critical role to play in financing water for sustainable development: concessional financing for water projects is essential.
- Look to industry for thought leadership on circular ecosystems that will reduce water pollution.
- Incentives to improve performance and attract private finance require economic regulation for water services - including incentives to agglomerate service providers to reach economies of scope and scale.
- Water service providers need to become more technically and financial efficient.
- Governance arrangements need to become clearer and more transparent.
- Training for professional water resource managers across all sectors will benefit from curricula designed specifically for their needs and in their own languages.
- Need to address and resolve the regulatory barriers that currently exist and inhibit investment in secure access to water, such as a lack of a clear regulatory framework for wastewater reuse.

Water-Energy-Food nexus

- Responsible agricultural water management, including climate resilience and pollution control is a major and necessary priority to secure equitable future access to water, food and energy while ensure ecosystems protection.

- **Governments must invest in less** water-intensive renewable energy.
- Efficiency measures along the entire agri-food chain must be boosted to help save water and energy. Protection of ecosystems alongside agriculture and energy production can ensure environmental integrity.
- Stronger water management, sector reform and greater efficiency and coherence across the WEFE nexus is overdue.
- Overall agricultural water efficiency and productivity can be increased via adapted crops and cropping practices, such as agroecological approaches or improved monitoring of water use.
- Transformative applications of water management systems must incorporate all elements of the water/energy/food/ecosystem nexus – including adaptation to meet the expanding needs of agriculture.

Sustainable economic and urban development

- Urban planners need to integrate system-wide water management to limit the footprint that cities have on water quality, quantity, and on energy and agri-food systems to reduce food loss and waste.
- Multi-level governance and integrated regional and urban planning - including compact city models - can conserve and rehabilitate water resources, water storage and retention and promote investment in climate resilient infrastructure.
- Renew focus on role of women, indigenous communities, the young, and vulnerable populations in ecosystems stewardship and water governance**.** These voices must be incorporated in water governance models that are future-oriented and equitable in outlook.
- Work with, not against natural ecosystems – focus on development of blue green infrastructure and sustainable drainage systems (SUDs).
- End water wastage: US$ 200 Billion is lost each year to as treated water leaks from municipal water networks – for the same cost, we could rehabilitate these systems, improve the efficiency of water distribution and save water for other uses.
- Consistent strategies and data-informed tools for the prioritization of irrigation investments are required to maximize financial efforts and deliver the highest impacts. Capturing increased land value around water canals, rivers and coasts is key for sustainable urban development.
- Better mobilize the private sector: make water-impact disclosure mandatory, and work with standard setters on due diligence and corporate accounting standards, and on the regulation of financial markets.
- Circular solutions: embed innovative data-led practices in support of interventions on water access, management and conservation for sustainable economic development across all sectors.
- Promote water accounting and auditing (including water tenure) to provide significant opportunities for global water stakeholders to make data-informed improvements to equitable and sustainable water access and quality.
- Open-source courses for IWRM and intersectoral water management must be built and shared
- Water tariffs must be adjusted to reflect the realistic price of piped water delivery service and to encourage innovation, and funding should be invested in research, testing and deploying new technologies. Embrace disruptive technologies in water delivery services.
- Place water access and management at the heart of planning processes.

VI. Guiding questions

- How do we develop mechanisms for engagement of stakeholders across water service valuation, the water nexus, and sustainable economic and urban development?
- Water and sustainable development: planetary problem with local solutions?
- Is it time for an Aqua Innovation Challenge?

Valuing water

- Will a focus on equitable outcomes for secure water access resolve the existing impasse between a rights-based and a valuation-based approach to water management?
- How can we grow the role of the private sector in supporting water innovation, both as investors and implementers?
- How do we build up the global water projects pipeline quickly?

Water-Energy-Food nexus

- What are the opportunities, incentives and trade-offs to drive systemic change in water management across food, energy and the built environment? What are some best practices that can be replicated and scaled up?
- How do we achieve greater efficiencies in the agri-food chain in support of sustainable water use?
- What is the role of hydrological economic modelling in support of blue and green economy integration and growth?
- What are the best alternatives to water-intensive renewable energy generation?

Sustainable economic and urban development

- How do we create incentives for innovation in water governance and finance for water?
- What are the principles and best practice for effective and transparent water monitoring systems?
- How can innovation and digital data help in managing the water resources better?
- How can countries better organize their water data systems to ensure all sectors are included and no one is left behind?
- How do we quantify the specific finance needs arising from governments' National Adaptation Plans, especially related to water infrastructure, and drought and flood mitigation?
- How do we acknowledge and build on the role already played by women as custodians of water in emerging markets? (Quantify the productive time saved by girls and women no longer spending hours each day sourcing water?)
- How can the water management knowledge of Indigenous Peoples be scaled to address the new challenges of decentralized populations and their need for secure access to safe water?