Sustaining Waters, Sustainable Cities: Urban Climate Change and SDG Policy Solutions Through Water Resilience

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In 2016, the UN General Secretariat and President of the General Assembly began advocating for explicitly linking the goals and processes around the 2030 Agenda for Sustainable Development and the UNFCCC, specifically the Paris Agreement. A high-level event targeting these issues took place at UN headquarters in March 2017. At the UNFCCC Bonn intersession in May 2017, the Parties agreed to address Sustainable Development Goal (SDGs) 2 (food security) and 11 (cities) at the upcoming CoP23 to be held in Bonn in November 2017, because of their strong connections to SDG 13 (climate action). As a result, these SDGs will be a crucial element of CoP23. How will these sectors be brought together across these policy domains? Representing experience from a broad set of institutions, regions, and approaches, the authors suggest that water can and should be the mechanism to link, coordinate, and implement the policies and processes of SDG 11 and the urban aspects of climate change.

Cities: Where Climate and Development Decisions for Resilience Happen

Cities are self-aware, dynamic, and have powerful histories and economies; by 2040, nearly 60% of the world's population will be living in them. This makes cities a key unit of social and economic organization and thus critical for decision-making on climate mitigation, adaptation and sustainability. The distinct history and evolution of each city shapes its urban resilience.

In this context, resilience considers the capacity of human social-ecological systems to thrive under both short-term weather-related shocks and long-term stresses due to shifts in climate, economic, and social change. Resilience also addresses the special needs and challenges associated with climate change. These characteristics are broadly consistent with definitions from ecological sciences (1-3) and from disaster risk reduction (DRR) (4).

Three critical resilience characteristics are persistence (the ability to "return to normal" by effectively coping with negative impacts or rapid-onset disasters), adaption (the ability to adapt to new norms effectively), and transformation (the ability to accommodate radical shifts beyond the tipping point in environmental or economic conditions). Because many cities do not currently meet this definition of resilience, efforts must urgently be undertaken to cultivate these capabilities across our rapidly changing planet.

Many cities, indeed most human systems, do not have these characteristics; most institutions optimize human progress relative to past patterns and historic norms rather than anticipating novel and uncertain events. While ingenuity has time and again demonstrated that we can persist, adapt and transform, efforts must be urgently undertaken to cultivate these capabilities across our rapidly changing planet.

Yet, transitions to new states and approaches are far from simple. As economic and political epicenters, cities drive resource use and extend their footprint across large areas into coastal, estuarine, and rural landscapes and across watersheds and energy grids. Water, energy, and food demands are interdependent and are most acutely concentrated in cities due to their population density and concentrated resource consumption.

Current trends in urban growth and resource intensification are expected to accelerate over the coming decades, especially in east and southeast Asia, sub-Saharan Africa, and Latin America. Given the concentration of populations and economies, cities are a preeminent concern regarding water-related disasters — coastal storms, saltwater intrusion, intense precipitation events, flooding, droughts, and changes in water availability, timing, and quality.

Such extreme events exacerbate the stresses on surrounding regions that provide the vital resource base for urban security - food, energy, labor, capital, and, perhaps most critically, water. Sudden shocks, like natural disasters, deeply impact cities' ability to adequately treat and transport drinking water and wastewater in and out of urban areas. Coastal and delta cities such as Lagos, Shanghai, and London are even more exposed and sensitive to such impacts. Current projections indicate such disasters will increase in frequency and intensity, especially for low-lying delta regions, often exacerbated by subsidence (e.g., from groundwater pumping).

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Water Flows Towards Cities

Urban regions are rarely confined to a single hydrological basin (surface and groundwater) residing within city limits. Instead, urban water decisions impact and are impacted by large spatial scales that intersect, merge, and override several hydrological basins. Thus, cities depend upon a broad landscape for the provision and various applications of water needs from energy and industrial use to residents' food, drinking water, and sanitation. How cities decide on storm- and wastewater regulation, parks and infrastructure creation and maintenance, and fluvial transportation and construction impacts this broader landscape.

This confluence of sectors around a single resource (water) is reflected in the large set of norms, regulations, organizations, and policies in different sectors. These commonly overlap and, in many cases, provide contradictory incentives and obstacles for efficient urban water management. When decisions are reached by examining only a single sector or a fraction of the impacted water landscape, the prospects for resilience and sustainability are reduced. Urban centers and rural areas are in a complex exchange network, increasingly centered not only on demographic and financial flows, but on even more vital flows of water resources. Thus, the role of cities in large-scale water management and water security decisions is especially important and provides a micro-example of what countries do regarding water management and water security on a national level.

Optimism and Opportunities: Can Water Drive Urban Resilience?

The authors of this piece represent a broad set of the water community interested in supporting the efforts and goals of building resilient cities through effective, water-aware sustainable development and climate policies. Cities and their broader landscape of influence cannot achieve or maintain long-term resilience without coherent and credible water management solutions that span sectoral, institutional, hydrological, and administrative boundaries. Thus, national, local, and global policies and financing for urban sustainability and resilience must be informed by sound water knowledge. Furthermore, urban water management must be informed by water-user sectors (i.e., environment, energy, transport, industry, and health). Water as an enabling resource requires special knowledge, tools, and insights for its effective management at large scales, across diverse institutions, and with robustness and flexibility in the face of climate uncertainty.

That water allows for greater clarity and convergence in efforts to navigate the complexities of sustainable development has not yet been widely understood and harnessed. Cities provide an opportunity to demonstrate the central role water plays in resolving the complexities of development in the modern era. Water can help to provide coherence across urban sectors and development aspirations, integrate holistic solutions, and serve all stakeholders. Using SDG 11 as a vehicle to link global sustainable development and climate policies through the 2030 Agenda and the UNFCCC process is an opportunity that has come just in time.

Defining Water-Coherent Policies for Resilience and Sustainable Development

As discussed above, urban decision-making processes need to consider all the basins and sectors that a city depends upon, and influences. Effective, long-term water resource management and decision-making needs to integrate all stakeholders--urban, rural, economic, social, and environmental. Currently, such integration is rare, threatening prospects of achieving both the UNFCCC and 2030 Agenda goals. Cities are where SDG targets and the nationally determined contributions (NDCs) to the Paris Agreement will be implemented at a local level. Additionally, cities themselves are subject of SDG 11, "Make cities and human settlements inclusive, safe, resilient and sustainable". The question then becomes, how can urban resilience capacities become integrated with specific policy agendas?

One of the most critical aspects of policy agendas is finance. Financial processes linked to the UNFCCC and the 2030 Agenda have the potential to mainstream a wide range of insights and recommendations, a pattern shown through such groups as the Water Global Practice at the World Bank. This group has integrated all water-relevant endeavors to achieve goals of finance, sustainability, institutions, inclusion and resilience.

For both the 2030 Agenda and the UNFCCC, finance mechanisms should make the assessment, accounting, and integration of water resources an explicit requirement for investment relating to SDG 11. Indeed, these elements are important aspects of identifying and managing investment risk. Specifically, these processes should:

1. Evaluate risk and vulnerabilities comprehensively, incorporating the full-scale impacts of any particular investment (e.g., a specific piece of infrastructure, planning process, or development strategy). The evaluation or assessment should incorporate, at a minimum, the entire water basin(s) or catchment(s) including any potential downstream impacts. Ideally, it would also examine the scale of influence or "usage" – which may extend beyond or across hydrological divisions – and reach out to all stakeholders in this broader region. This larger scale could be conceived as a "water resilience landscape".
2. Verify that water resources are accounted for across sectors, industries, and ministries. In many cases, this will include a strong "nexus" approach (cf., Mohtar and Daher [2012]) that identifies sectors and institutions using water resources that may not self-identify as "water users or managers". Such sectors include energy, sanitation, healthcare, industry, and agriculture. Of course, the same processes should also occur with traditional water sector investments (e.g., water utilities). Moreover, while traditional nexus approaches optimize based on an assumption of stable water resources, a more progressive approach is to develop more robust and flexible non-optimized frameworks that can respond to evolving water conditions.
3. Assess the climate risks for infrastructure and systems investments in terms of their operational lifespan rather than just over the finance period. In many cases, this should shift the frame of sustainability from 10 or 20 years to 50 to 100 years.

4. Ensure that investments, and the resulting planning and operations, are built on the emerging body of resilient water knowledge, especially related to risk assessment and risk reduction.
5. Integrate and conjunctively manage water sources (surface, groundwater, green and blue water, and water management infrastructure).

Beyond finance mechanisms, a broader set of policy instruments and processes in the UNFCCC and SDGs should be implemented to further water-centered urban resilience:

1. Continue and reinforce their endeavors to bridge global agendas to render efficient implementation of the shared objectives at global, national, and local levels. Action plans supported by member states at the UN Conference on Oceans in June 2017 should also be taken into consideration given the deep connections between freshwater and marine resources.
2. Closely link the adaptation and DRR agendas to better anticipate, plan for, respond to, and reduce the potential for crises. Additionally, the agendas should identify new risks and emerging challenges. Recovery processes can serve as a mechanism for upgrading and improving systems and making investments that build resilience to changing conditions and result in more equitable and sustainable outcomes.
3. Conjoin the adaptation and climate mitigation (greenhouse gas emissions) policy agendas with reference to urban water resilience. Water is often a critical element in most energy generation systems (e.g., nuclear, coal, solar, hydropower, biofuels, biomass) while urban water transport and treatment are often energy-intensive processes.
4. Recommend the development and application of indicators to track water usage across sectors at the full water resilience landscape (i.e., the full spatial scale influenced by cities). These indicators would help identify and monitor use in order to reduce and avoid conflicts among sectors and stakeholders. In most cases, this work will include planning for the resilience and adaptation of dependent social-economic systems through a freshwater resource base for economic sectors.
5. Encourage the analysis of future water conditions over many scenarios and the implementation of water governance and allocation approaches that can adapt and transform to accommodate changes in the water cycle.
6. Provide guidelines to properly value water for environmental, social, and emerging climate-relevant externalities. These can then be translated into pricing and incentives to spur gains in efficiency, economic value, and innovation (exhibited, for instance, by the Bellagio Principles on Valuing Water, 2017).
7. Integrate natural and managed systems in designs and decision-making for sustainable development and resilience so that the natural eco-hydrological landscape is included as an explicit stakeholder in allocation decision-making, such as through the application of nature-based solutions, environmental flows, and ecosystem-based management approaches.

Furthermore, the UNFCCC may need to undertake a more systematic analysis of how water affects its specific subsidiary bodies, such as the Adaptation Committee, SBSTA, and others. Currently, the UNFCCC largely treats water as a sector on par with other sectors such as energy, agriculture, cities, and forests. Water is a sector for institutions such as utilities, but water is also an enabling resource and instrument necessary for many sectors (including the water sector) – and a resource that should be rationalized across all relevant sectors.

Signposts of Success: Aligning Agendas and Actions

Much work remains to be done for the successful alignment of policy and action for urban resilience. In conclusion, here are four examples beginning to make this alignment a reality.

1. *Linking climate adaptation, water management, and disaster risk reduction (DRR) policies and actions.* DRR and climate adaptation efforts both aim to prevent and reduce extreme event risks by diminishing vulnerability and increasing resilience but often focus on different timeframes and threat analyses. However, progress is happening. Working on developing a shared terminology for both DRR and climate adaptation professionals can help mainstream water management even in the face of disaster. Some cities have already been effective in developing a common and actionable framework, such as the Rotterdam Climate Initiative 2013 (7). The Netherlands has frequently suggested a formal DRR and climate change adaptation platform be established to share experiences and lessons learned, to define the synergistic interventions, and to embark on joint quests for innovative financing (5). The Sendai Framework DRR targets have been merged into the 2030 Agenda, specifically SDG 11.5 (Sustainable Cities and Communities) and SDG 13.1 (Climate Action).
2. *Mainstreaming resilience into water investments.* In 2015, with the support of the University of Massachusetts, Amherst, the World Bank published an innovative methodology that integrates a new generation of best practices for assessing and reducing climate risks in water-related investments (8) . This approach – referred to generally as decision scaling – develops robust solutions for a wide range of investments, considering uncertainties associated with long-term impacts on the water cycle. More recent applications include basin scale planning, such as for the Valley of Mexico (inclusive of Mexico City and its surrounding region). Forthcoming decision support approaches include tailored applications of the methodology to urban utilities as well as energy systems, especially related to hydropower. Decision scaling also contributes to developing flexible, practical decision-making pathways, given unfolding climate uncertainties to ensure that investments and interventions are timed and focused efficiently (9).
3. *Governing urban-landscape water at the appropriate scale.* Managing water effectively at urban scales requires understanding that cities are not defined by their administrative frontiers and that many technical solutions exist and are well-known. The challenge is fostering good governance: articulating who does what, at which scale and how. The OECD has developed and harmonized a common definition of "metropolitan areas" to increase international

comparability of the economic, social and environmental performances of 275 cities with over 500,000 inhabitants – called "functional urban areas".

This definition is based on where people live and work and chooses the functional urban areas building blocks as the smallest administrative units for which national commuting data is available. In addition, the OECD Principles on Water Governance, endorsed at ministerial level in 2015, provide 12 principles to effectively design and implement water-related policies across levels of government, spatial scale, and sectors (10). Some 42 countries and 140+ stakeholders adopted these standards; indicators and best practices are underway to support their implementation. Principle 2 calls for integrated basin governance systems and multi-level stakeholder-driven engagement. These principles have also informed investment processes, such as water resilience criteria for green and climate bonds.

4. *Coordinating resilience and sustainability landscapes.* The global engineering and design firm Arup, a management consulting company, with support from the Rockefeller Foundation, is embarking on a project to develop the City Water Resilience Framework. This project will provide a common understanding of the characteristics of a resilient urban water system – a global standard for urban water resilience assessment. The framework will recognize the complexity and scale of any urban water system and build resilience against a wide range of risks in the face of an unknowable future. The approach seeks to leverage the influence of cities within their basin to act as a convening force – bringing stakeholders together from across the basin to make more resilient decisions and deliver better outcomes. Hopefully, cities can use the City Water Resilience Framework to diagnose resilience vulnerabilities and inform a set of prioritized interventions to address them.

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About this publication

This background paper, prepared by the Alliance for Global Water Adaptation (AGWA) and its members, is a contribution to the discussions and activities at the Conference of Parties 23 (CoP). This year, the CoP will also focus on SDG 2 (Agriculture and Food security) and SDG 11 (Cities) in order to identify key areas of collaboration and interlinkages between the 2030 SDG Agenda and the Paris Climate Agreement.

Note on authors: Though all of the authors are associated with one or more institutions, we are writing here as individuals and members of AGWA: the Alliance for Global Water Adaptation, an international network to develop, synergize, and promote the emerging best practices and policies for resilient water resources management.

AGWA's member organizations stand committed to contribute to capacity building and support the integration and application of water knowledge in the climate mitigation and adaptation activities. This includes providing guidance and recommendations on how water management can contribute to an efficient implementation of the Paris Agreement and the 2030 Agenda. Its secretariat is hosted by Stockholm International Water Institute (SIWI).