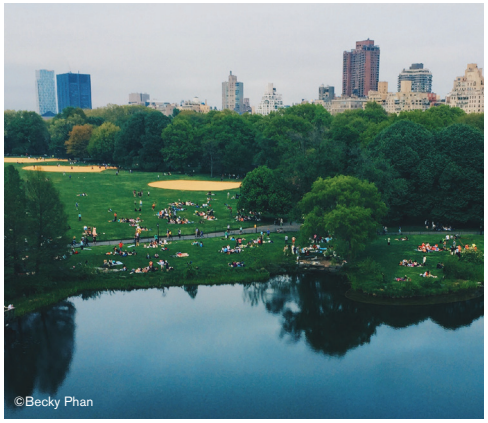

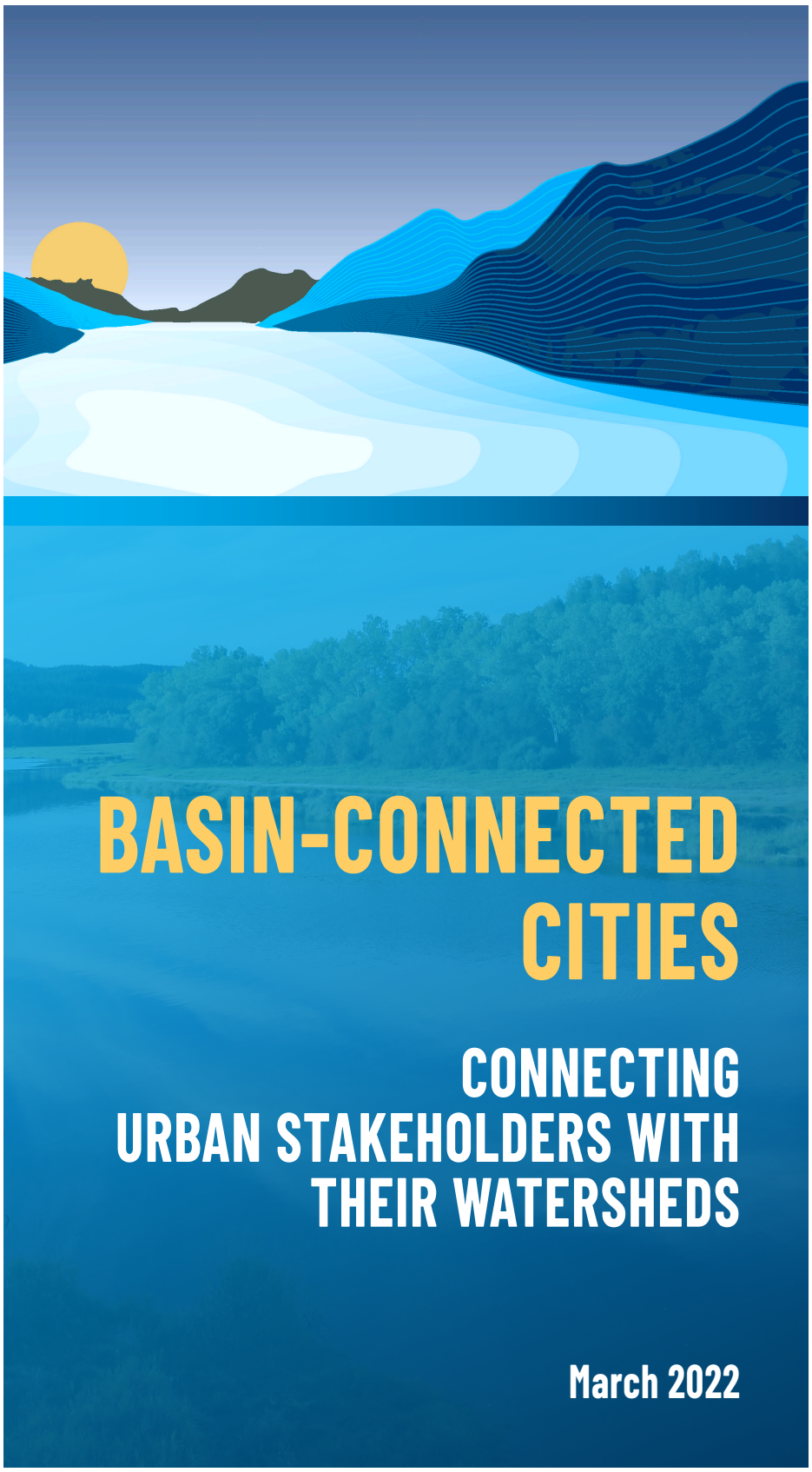

BASIN-CONNECTED CITIES

CONNECTING URBAN STAKEHOLDERS WITH THEIR WATERSHEDS

March 2022

FOREWORD

Eric Tardieu

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Around 55% of the world's population live in urban areas or cities, and this is expected to rise to 68% by 20501. As cities grow there is increasing pressure on natural resources within and beyond their hydrological basins. While water connects across sectors, places and people, as well as geographic and temporal scales, hydrological and administrative boundaries do not always coincide.

Building a "City-Basin Dialogue" can be a mechanism to move towards sustainable water management. Different stakeholders from catchment to consumer can be engaged in identifying and implementing appropriate and sustainable solutions for effective city-basin multi-level governance. Connecting urban water and basin management aims to improve awareness and protection of water sources within and beyond urban boundaries, sustain both the quantity and quality of water resources, and prepare for extreme events and the impacts of climate change.

Managing current and future water challenges is not limited to technical solutions and requires appropriate public policies. Adaptive water governance across scales contributes to the design and implementation of such policies as part of a shared responsibility between different levels of government, civil society, businesses and other urban and basin actors. The governance of water resources across cities and their basins needs to ask not only "what to do?" but also "who does what?", "why?", "what level of government?" and "how?"

To encourage and support the dialogue between cities and basins, IWA and INBO have partnered to develop a Handbook on Basin-Connected Cities, which builds on the framework of the IWA Action Agenda for Basin-Connected Cities. A summary of this publication will be presented at the 9th World Water Forum in Dakar, aiming at raising awareness of the relevance of city-basin dialogues. The full Handbook, to be released at the IWA World Water Congress and Exhibition, in September 2022, provides inspiration and guidance for urban and basin actors in implementing multiple-scale integrated water management.

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Melbourne © Denise Jan

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Kunshan © CRC WSC

BACKGROUND

Many of the global challenges such as urbanisation, climate change, increased resource demand and competition between different water users, impact the cities where most of us live. These create water risks for cities including flooding, water scarcity and pollution. Flooding can cause loss of life, homes and infrastructure, and negatively affect economic activities within cities. Floods also disrupt and limit access to resources that cities rely on, not only water, but also food and energy. Water scarcity and drought often lead to costly investment in capital intensive approaches to secure supply, and potentially use of unsafe alternative sources. Declining water quality can affect water supply and sustainability. According to a 2019 World Bank report, when rivers become very heavily polluted, regions downstream see reductions in economic growth, losing between 0.8 and 2.0 percent of economic growth[2].

These pressures and challenges highlight the need for more sustainable urban planning and public services. At the same time, linkages between urban and rural areas can be strengthened by building on their existing economic, social and environmental ties. By proactively taking part in basin management, the city secures water, food and energy resources, protects water quality, and increases resilience to extreme events. It is an opportune time to encourage collaborative action to improve connectivity between urban and wider basin stakeholders to optimise costs, resilience, and biodiversity. Implementing appropriate and sustainable solutions in line with governance in cities and their basins means working towards public policy coherence and efficient water management across administrative boundaries and sectors. This includes stakeholder engagement across catchments involving institutional actors, representatives of the civil sphere and citizens.

ABOUT THE BASIN-CONNECTED CITIES HANDBOOK

The IWA-INBO Handbook on Basin-Connected Cities aims to support decision making in strengthening the city's connection and integration with its river basin. It expands on the **IWA Action Agenda for Basin-Connected Cities**, which provides a framework to influence and activate utilities, cities and their industries to become water stewards working with basin stakeholders. The Action Agenda and the Handbook have 3 main parts:

- **Drivers for Action** outlining how basin-wide risks are impacting urban areas from economic, environmental and social perspectives;
- **Pathways for Action** demonstrating how cities and their basins can actively cooperate; and
- **Foundations for Action** which are the elements needed to create an enabling environment to implement the pathways.

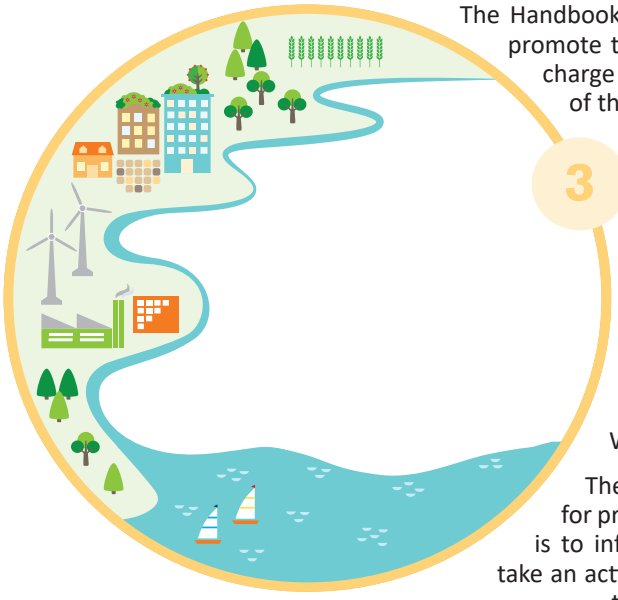

Figure 1: Third level of action - Basin Connected Cities - from the IWA Principles for Water Wise Cities

The Handbook also draws on INBO's principles and objective to: 1) promote the exchange of experiences between organizations in charge of river basin management; and 2) raise the awareness of the general public on water resources management.

The Action Agenda for Basin-Connected Cities builds on **IWA's Principles for Water-Wise Cities**, which aim to integrate water in planning across scales. The Principles support city leaders planning a future-proof access to safe water and sanitation for everyone in their cities, while delivering enhanced liveability for people and nature. Basin-Connected Cities is the third level of action in the Principles Framework (1. Regenerative Water Services; 2. Water Sensitive Urban Design; 3. Basin Connected Cities; and 4. Building Water-Wise Communities).

The Handbook is a comprehensive and detailed resource for practitioners, structured for quick reference. The purpose is to inform, influence and encourage urban stakeholders to take an active role in protecting and investing in water resources, together with basin and catchment organizations. It provides more depth and understanding of the framework, including:

- Why and how urban stakeholders can lead the way in realizing their role as water stewards; and
- Real examples of the different pathways and activities towards improving dialogue between cities and basin organisations and stakeholders to achieve sustainable water management.

The target audience includes multiple stakeholders with different roles in taking action in improving their water sources and watersheds. This includes political or technical decision makers in water and sanitation services, local governments, industries, developers, inter-municipal structures, basin organizations, water management agencies. Engagement with civil society and environmental groups is also important to convey the key concepts and messages to a broader audience.

A key reference for the Handbook is a series of case studies or "basin stories'' that have been developed over several years by IWA and more recently through INBO. The basin stories document some of the best practices and approaches that demonstrate how stakeholders, especially those in urban areas (e.g., city government, water and wastewater utilities, industries) are taking part or contributing to sustainable management of water resources. Greater basin-level collaboration from catchment to consumer is essential for sustainable water management in the face of growing demand on water resources and global change. The stories aim to inspire urban stakeholders to be aware and respond to what is happening in their watershed. Excerpts from the basin stories are incorporated throughout the Handbook, and full versions will be available online through IWA and INBO.

DRIVERS FOR ACTION

The Drivers for Action reflect the top risks impacting cities today including: floods due to extreme events, decline in water quality, and water scarcity and droughts[3].

Extreme events arising from climatic and environmental issues, including floods, heavy rainfall, sea level rise as well as droughts and increased temperature, pose a real challenge for watershed management. The recent 2021 IPCC report specifically mentions how urbanisation intensifies heatwaves, as well as can increase mean and heavy precipitation over and/or downwind of cities, resulting in runoff intensity. It also shows how coastal cities are dealing with a combination of sea level rise and storm surge, and extreme rainfall/river flow events leading to higher probability of flooding[4].

Addressing the root problems of these risks can be supported by urban stakeholders including city governments, utilities and industry, to actively engage and contribute to watershed management by working with basin level organizations, their networks and other basin level stakeholders such as agriculture, mining, environment, and indigenous and local communities.

FLOODING

The phenomenon of flooding is a natural event which can bring both adverse and beneficial environmental change. Civilizations have adapted to natural flooding by constructing cities around lands that are subjected to periodic floods to have access to water and fertile farmland[5]. However, human activities including urbanization, upstream land uses (forest, agricultural practices) and construction of dams are influencing the magnitude and impact of floods. Furthermore, climate impacts on the hydrological cycle are changing the timing and intensity of rainfall, directly affecting the quantity and quality of water resources for different users[6]. Projections show that more people will be at risk from floods by 2050 (from 1.2 billion today to 1.6 billion), especially in coastal cities[7].

Severe floods can result in physical damage and loss of life, as well as indirect damage such as waterborne diseases[8]. If drinking-water sources become contaminated and there is no available alternative treatment of water supplies, then flood victims are increasingly at risk of infection and disease. Flooding also disrupts economic and supply chain activities. Economic losses are mounting as exposure increases due to climate change impacts that are leading to more intense rainfall events and greater likelihood of severe floods. For example, severe flooding that hit Copenhagen in 2011 caused about EUR 700 million of damages; and hurricane Sandy in New York City generated USD 19 billion of economic losses in 2012[9].

Severe degradation of watersheds can diminish their ability to be a natural buffer against water-related hazards such as floods, leading to even greater damage to urban life and infrastructure. For example, in the Jucar Basin (Spain), one of the basin stories to be featured in the Handbook, water pollution problems and dense urbanisation have led to rivers being modified to become drainage channels. The original ecosystems have been reduced due to increasing deterioration resulting in a greater risk of flooding as there is no longer any buffer

zone. Furthermore, flooding in dense urban areas can cause further damage to the surrounding ecosystems due to overflow of sewage systems resulting in raw sewage being carried into waterways.

DECLINING WATER QUALITY

Just as important as having access to water itself is that water is clean and safe for drinking. Urban water quality is impacted by both localised pollution as well as activities in the wider basin. Although many countries have increasingly strict management of point source pollution, dumping untreated wastewater into rivers and oceans especially in developing countries is still a common practice. This has resulted in about 25% of urban residents in developing countries unable to obtain adequate water[10]. Poor water quality affects human health leading to a decline in livelihood and social well-being. Furthermore, reduced access to safe water can impact hygiene making it challenging to control water- and vector-borne diseases.

Declining water quality due to watershed degradation, as well as from point and nonpoint sources has a direct impact on aquatic ecosystems and drinking water, and the economy in downstream urban areas. Economic impacts include the direct increase of costs for water treatment for different users and the loss of production revenue due to disruption in supply to industry. It is estimated that the total cost of watershed degradation to water utilities is about USD 5.4 billion annually[11]. Poor water quality can also lead to a decline in property values, loss of recreational revenue, effects on human health which in turn affect economic productivity, and loss of livelihoods.

Water pollution poses serious threats to the environment in cities and their wider basins, leading to the loss of key ecosystems, and impact fisheries and agricultural productivity. Discharge of pollution into water bodies can influence dissolved oxygen availability and temperature of the water leading to changes in nutrient and contaminant concentrations, which result in aquatic species deaths or eutrophication. Furthermore, algal blooms from increased nutrient loads can produce toxins which contaminate water resources.

Fez, Morocco © Bureau EAST

Water quality can also influence food supplies to urban areas. Contaminated water can impact soil productivity and reduce the production and quality of crops leading to negative implications on the food sector as a whole. For example, one of the case studies included in the Handbook shows that pollution from local industries in Fez, Morocco cannot always be effectively treated by the wastewater treatment plant resulting in discharge of polluted effluent to the Sebou river. This in turn has led to reduced quality of water used for irrigation which is extracted from the Sebou River.

WATER SCARCITY AND DROUGHTS

Water scarcity is a result of human activities that have led to low availability compared to demand. On the other hand, drought refers to the state of the system and is a natural hazard, caused by large-scale climatic variability. The severity and frequency of droughts can lead to water scarcity situations, while overexploitation of available water resources can exacerbate the consequences of droughts[12,13].

Currently, 2.3 billion people live in water-stressed countries, of which 733 million live in high and critically water-stressed countries[14]. Cities face unprecedented hydrological changes due to global climate change and land use change, and when combined with increasing water demand can exacerbate water scarcity and drought. There are currently 150 million people in urban areas that do not have sufficient water, meaning less than 100 litres per day which is needed to maintain the basic living standards of residents[15]. The water supply in cities for drinking, sanitation and other household purposes can be severely impacted as demand for water in the food and energy sectors increases. Water scarcity can lead to inequitable allocation and distribution of available water among different sectors.

Reduced water availability in cities is more likely to affect low-income groups and can increase social stratification in urban settings. It can lead to increased dependence on potentially less safe alternative water sources that might otherwise be avoided. On a city-wide scale, water scarcity can increase the rate of over-abstraction of groundwater leading to depletion, land subsidence and deteriorating water quality making it unsuitable for human consumption. As a consequence, water scarcity can mean that there needs to be costly investments such as basin transfers to secure supply. For example, in Mexico City, another basin story to be showcased in

the Handbook, the depletion of groundwater increased abstraction costs as water needed to be pumped from greater depths and caused the city to sink as the underlying soil structure was compacted, generating damage to infrastructure and in particular to the drainage system. To cope with the city expansion and increased water demand, an extensive investment was made in infrastructure in the 1940s bringing water from the basins of Cutzamala and Lerma across the mountains, over a one-kilometre altitude variation.

Economic activity is water dependent, and shrinking availability of water is not only endangering urban economies but also the global economy as a whole. In fact, droughts are the costliest natural hazards on a year-to-year basis and are significant and widespread, affecting many economic sectors and people at any one time. There are direct impacts such as decreased agricultural outputs, disruption in industrial operations, and indirect such as rising costs of food in cites. Drought in the USA has an average cost of USD 9.7 billion per event, and the most fatal when accompanied by heat waves[16].

PATHWAYS FOR ACTION

The Pathways for Action describe various approaches that inspire stakeholders to take action and deal with water challenges in the wider catchment and play an essential role in ensuring water quality and quantity. They are categorized into assessment, planning and implementation.

Urban stakeholders need to recognise their reliance on the upstream watershed and their role in maintaining ecosystem services from both upstream and downstream areas such as estuaries, deltas and coastal receiving waters. What actions need to be taken by cities today to address the drivers for action? How can cities play a role in achieving sustainable management of basins in the future? How can utilities participate more actively in water governance?

ASSESSMENT

Assessment looks into approaches for evaluating a problem and the measures that can be taken. This includes:

- Identifying values and principles which provide the roadmaps to achieve common objectives;
- Investing in data and information systems as it is only feasible to manage what can be measured (and analysed); and
- Integrating local and traditional water knowledge to complement what is being scientifically measured and analysed.

An agreed set of values can provide motivation and guidance towards action on achieving basin-connected cities. These values can be defined and then systemised into a written set of principles, that can provide the roadmap on how to deliver on mutual objectives for using water within the city and the whole basin. Developing common principles can bring together local governments, urban professionals and individuals to actively participate in solving and finding solutions to water problems in their cities. Developing a strategy or plan can also provide an opportunity to agree on a set of values and principles for the future. For example, one of the basin stories focusing on the Guandu Basin in Rio de Janeiro State, Brazil, explain how the basin committee and water agency have developed a Strategic Water Resources Plan which is divided into eight Thematic Agendas and several lines of action. These thematic agendas provide a roadmap to how stakeholders can implement the agreed objectives for the future.

Porto © Shutterstock

Decision-makers at all levels from city to basin to transboundary need data, as it sustains the continuous management of water resources. Water resource managers need to be able to access and use reliable, up-to-date and relevant information for regulatory purposes, planning, risk management and public awareness. How an organization uses and manages its data is just as important as the process of gathering the information. Consequently, holistic information systems that integrate data and information from across a basin provide a sound basis for cooperation as well as decision making. As featured in the Handbook, such a system was put in place by Águas do Porto, Portugal, with an innovative real-time management platform for the full water cycle. This integrated management system improved efficiency around operation and maintenance activities in water networks, changing the asset management approach to proactive rather than reactive, which reduced pollution events in urban streams.

Water management needs to use both traditional and local knowledge as well as scientific information. Citizen science can be used to improve management practices by providing more frequent monitoring and data collection. This approach can improve participants' knowledge and awareness which can increase confidence in both the quality of water and the water company. Water management can also learn a lot from traditional water conservation systems. For example, a basin story about Huzhou, China, described in the Handbook illustrates how the historic Lougang system has been rehabilitated to control water drainage, irrigation and provide waterway transportation, as promote historical and cultural values.

PLANNING

Improving planning focuses on approaches where cities and their basins have an opportunity to cooperate to ensure sustainable water management. This includes:

- Having a risk-based approach to planning from catchment to consumer;
- Water allocation mechanisms which balance downstream and upstream needs, but also explore alternative sources;
- Alignment of urban development with basin resources and management; and
- The active involvement of diverse stakeholders in developing plans for water resource management.

Prevention and preparedness actions are effective ways to build resilience when managing water resources for cities and their basins. This can be achieved through risk-based planning, which promotes a proactive approach to identifying, controlling and monitoring critical risks. Risk-based planning approaches such as water safety planning as well as flood and drought planning involve stakeholders across the water value chain in the management of drinking water quality and flows, actively linking urban stakeholders (e.g., water utilities, industries) with the catchment they rely on for water sources. An example featured in the Handbook explains how Melbourne Water worked with the city's three water retailers to jointly develop drought response plans to coordinate water supply system management. The plans included monitoring of storage levels, stream flow into reservoirs, catchment conditions and climate outlooks, and managing supply and demand actions.

Increased pressure due to urbanization, competing demands and climate change can create tensions over water allocation regimes highlights the need for long-term strategies of sharing water between urban and rural areas. Water allocation mechanisms to share water resources between different users in rural and urban areas should be based on Integrated Water Resources Management (IWRM) principles, which recognize the interconnection between upstream and downstream regions, urban and rural areas, and how changes in water quality and quantity in one area will affect the availability of resources in another. The San Francisco, basin story featured in the Handbook describes that much of the city's water supply is more than 250 km away in the upstream catchment. An approach was established to manage water resources for long-term resiliency and reliability through rainwater harvesting, use of groundwater, and collecting wastewater and greywater for non-potable applications such as toilet flushing and irrigation.

Boubre, France © SMABB

Aligning urban development with basin management is a step towards sustainable economic, social, and environmental relations. The urban–rural interface can contribute a great deal to protecting cities against water risks such as floods now and in the future, through cooperation between upstream and downstream users. An example of this in the Handbook is the Boubre Basin case study, in France where continuous urbanization and development within the basin over the past years has led to an increased risk of flooding. The Flood Prevention Action Programme connected both urban and rural stakeholders across the basin increasing farmers' awareness and acceptance for constructing flood protection measure on their lands that protect downstream cities.

Stakeholder participation in planning and management, can create a dialogue between those that impact and are impacted by the quality and availability of water supplies to cities and other users. Stakeholder collaboration is not only among scientists and policymakers but also the public. Such processes improve decisions as communities have more in-depth knowledge of the local conditions, increases effectiveness, increases public awareness, and provides platforms for the public to express their concerns. The Büyük Menderes River (Turkey) basin story describes how a multi-stakeholder committee from different sectors such as water utilities, municipalities, representatives of the Ministry of Environment and Urbanization, universities, and the organised industrial zone was established to prepare river basin plans, flood and drought management plans as well as monitoring plans. These diverse water stewards are close to actual problems and also aware of the status of polluters.

IMPLEMENTATION

Tools to implement connectivity between cities and their basins include

- The use of financing mechanisms such as where downstream users compensate upstream stakeholders for activities that sustain water quality and quantity;
- The integration of nature-based solutions (NbS) within the catchment and urban areas to improve water quality and reduce the impact of extreme events;
- Creating partnerships that build trust and cooperation to effectively share and manage water; and
- The use of digital technologies to improve monitoring and management.

An approach that illustrates the use of financing mechanisms for improving water quality and quantity is in France where the Water Agencies and Offices that oversee collection of fees from economic sectors (industry, household, agriculture) who abstract water or discharge polluted water. Over time, the use of fees has shifted from a sole focus on building treatment infrastructure to one that incorporates natural and urban ecosystems. For example, support is provided to local authorities for restoring and protecting aquatic environments, in particular waterways – revegetation, ecological continuity – and wetlands.

The example from France illustrates a move towards payment for watershed services (PWS) schemes that use funds from water users (including governments) as an incentive for landholders to improve their land management practices and connect basins and cities to protect water resources. They have been regarded as a promising approach to coordinating the interests of upstream and downstream ecosystem services stakeholders, as they create structures to implement activities to protect the catchment, monitor investments upstream, and measure their impacts. An example from the Handbook focuses on Quito (Ecuador) where the city's water supply is derived from the Andean mountain systems, including protected grasslands known as *páramos*. A Water Fund called the Fund for the Protection of Water (Fondo para la protección del Agua – FONAG) was set up as an endowment fund that receives money from public utilities, private companies and non-government organizations. Financial returns made upon this endowment are used to finance water conservation activities in the water supply catchment. Such financing mechanisms which support PWS can create governance structures that allow downstream stakeholders to support and incentivize source watershed protection on lands owned and managed by those living upstream.

Tana River © SGT R.A. WARD

PWS and equivalent financing schemes invest in upstream NbS to help reduce the costs of operation and maintenance of urban water utilities, improve service quality and delay the need for expensive capital investment to improve or expand services. Integration of NbS within cities and their basins can reduce nutrient leaching and erosion/sediment runoff and improve the health of watersheds to provide better water quality and flows. An example in practice is presented in the Nairobi (Kenya) basin story: the Upper Tana Nairobi Water Fund (UTNWF) is a driver for the city of Nairobi to shift from solely investing in grey infrastructure (water treatment plants and reservoirs) at the urban level to investing in green infrastructure. A restored watershed yields enhanced water storage capacity and improved water quality through natural filtration and retention of sediment.

The management of NbS for improved water management can assist in formalizing and activating partnerships across a catchment including national and local government, local stakeholders and community-based organizations, the private sector, and donor agencies. Building such partnerships from catchment to tap across sectors and scales can catalyse action in sustaining and improving water quality and flows to and from cities. Partnerships also provide a foundation for building trust across organizations in urban areas and their wider basins, and be used to solve local water challenges, pool expertise and resources, and leverage financial resources. The Yorkshire (United Kingdom) basin story describes how the Living with Water partnership aims to reduce vulnerability to flooding and increase resilience through infrastructural projects and activities working with the public sector, private sector and communities

While partnerships are a demonstration of collaboration between cities and their basins, the digital water economy, which includes the technologies and processes to support their implementation, is a key tool for these partnerships to manage urban water[17]. This includes using digital technologies to support availability and access of information (e.g., real time data and forecasting) across the water sector from upstream water management to urban consumers. Digital technologies support availability and access to information (e.g., real time data and forecasting) across the water sector from upstream water management to urban consumers. An example

described in the case studies is the Ebro River Basin Authority in Spain which has put in place measures to increase awareness and co-responsibility on flood management. This includes the use of a digital tool in the form of a web application «check your risk» which allows every citizen to check the risk of flooding of their property. The same application shows information on the flow associated with each zone.

FOUNDATIONS FOR ACTION

The Foundations for Action are what is needed to enable delivery of sustainable urban water management. They are derived from the building blocks of the Principles for Water Wise Cities and include vision, governance, knowledge and capacity, planning tools, and implementation tools.

VISION

A vision motivates stakeholders to define a common set of objectives for the greater benefit of both the city and the basin and is the stepping stone to ensure implementation of policies and strategies. A vision needs to be agreed and owned by multiple stakeholders. Collaborative processes can support this, by navigating the understanding of being more than a water user, but a water steward that contributes to defining long term ambitions for the whole basin and its beneficiaries. For a vision to be established it needs to be translated into local policies and adequate governance. It also needs the right tools, such as masterplans and financing mechanisms, and improved knowledge and capacity to guide action.

Kunshan © ken-qcl

For example, one of the basin stories showcased in the Handbook describes how the city of Kunshan, China has developed the "Kunshan Sponge City Special Plan". The plan was jointly approved by several urban stakeholders, aligning the urban water vision across the city. This has led to 22.9 km^2 being designated as a Sponge City demonstration area. This plan has created a common vision across departments that Kunshan will deliver government wide responses, involve public and private sectors to protect and enhance its canals and waterways, and progressively transform into a water-wise city.

GOVERNANCE

There can be spatial-scale misalignment between implementation of urban water governance to that of the wider hydrological and natural water system which a city depends on for water, food, and energy, as well as other resources. Improving water governance can be undertaken through different approaches that places a city in the context of their water catchment to better understand and address the upstream and downstream influences from e.g., water, sediment, and pollutant flows.

Good governance is key to coordinate policy and implementation between local, regional and national governments. This includes agreement on the roles and responsibilities of urban stakeholders in taking action to improve their water sources and watersheds (water and wastewater utilities, city governments, industry, policy makers and regulators). These urban stakeholders work with basin organisations, water resources agencies, civil society and environmental groups to ensure equitable and effective water management. There are also stakeholders that use water in basins which cities rely on for their water security such as agriculture, energy, natural resource extraction and other business interests. All parties need to actively work together to ensure sustainable and equitable water allocation across sectors from catchment to consumer.

An example described in the Handbook is from Peru, where the successful implementation of Mechanisms of Rewards for Ecosystem Services (MRSE) depended on the governance arrangements between utilities, stakeholders, water organizations, communities, citizens and government agencies. Each stakeholder had clear roles and responsibility. The regulator (SUNASS) has control over tariffs and utilities. The Ministry of Housing, Construction and Sanitation (MVCS) designs, monitors and regulates policies at basin and national level. They work in cooperation with municipalities, and approve policies and oriented plans to achieve objectives. Utilities collect fees and provide water and sanitation services; local governments and municipalities finance the technical programmes; citizens support the protection of the environment services and basins by monthly paying their fees for water supply; and NGOs provide support, funding, and advice during the implementation process of the law in the pilot basins and in a later stage in major cities.

KNOWLEDGE AND CAPACITY

An understanding of what are the current competencies and capacities of both urban and rural stakeholders is needed to effectively contribute to IWRM across a basin. Capacity building is crucial for better water management, including training, data management, expertise, and support to water stakeholders and information systems.

Knowledge exchange and learning from other cities and basins about solutions to common challenges can introduce new ideas and approaches that can be tailored to the local context. For example, "peer to peer learning" which encourages continuous knowledge exchange between organisations, cities, basins, etc can be a way to lessen the knowledge gap and help develop relationships that can provide continuous support.

An example of peer to peer knowledge exchange which accounts for the role of cities in the wider basin is the Megacities Alliance for Water and Climate (MAWaC), an international collaboration forum that facilitates dialogue on water, through which megacities will learn from each other's experience, exchange best practices, partner with appropriate technical, academic and financial institutions, as well as design and implement their individual responses to the challenges of climate change. MAWaC offers its members the pooling of experiences and best practices, support for the design of technical tools and models of urban water governance, the sharing of strategies and scientific studies, partnerships between operators in order to improve the adaptation capacities of each megalopolis to the impacts of climate change.

PLANNING TOOLS

Planning tools such as decision support systems, integrated water resource management plans, as well as risk-based planning can support the alignment of urban development with basin management. Planning can also be framed around a key issue such as floods or droughts. These can be used to raise awareness of flood (or drought) risk and promote protective measures among the population, improve land planning especially in urban areas, improve predictive capacity; strengthen coordination among public administrations; reduce vulnerability; reduce flood hazards, and improve the environmental condition of water bodies. There is a need for coherent planning documents and strategies between the city and basin levels.

Hobart, Australia © Derwent Estuary Program

There are a variety of urban stakeholders that play a role in planning, and their engagement is important to create a shared sense of responsibility as well as integration of local knowledge. The Handbook showcases the example, of the state of Victoria in Australia, where there has been establishment of Integrated Water Management (IWM) Forums which bring together organisations with an interest in water issues. The IWM forums coordinate, prioritise and oversee place-based IWM Plans, and identify preferred servicing options and implementation arrangements in growth or urban renewal areas. These community-driven projects to enhance an established area such as transformation of a concrete drain into a naturalised waterway and wetland, creating a revegetated recreational corridor[18].

IMPLEMENTATION TOOLS (POLICY, REGULATION AND FINANCING)

Policies can establish clear guidelines, with appropriate thresholds and limits based on the best available science. Policies and the resultant laws provide the foundation for a course of action, and regulations provide the directions for implementation. Then regulations create incentives that drive improved water management by urban stakeholders. This could be in the form of financing mechanisms which, for example, can help source funds to resource upstream catchment restoration activities to improve drinking water quality. Implementation of such funding mechanisms need enablers and leaders to create awareness, a business plan, and an implementation structure.

The Handbook describes an example of the intersect between regulations and financing is from the municipality of Skanderborg in Eastern Denmark. The municipality developed a climate change action plan to identify vulnerable areas and address flooding. This was implemented with partners such as the water utility through climate adaptation projects. For example the utility transformed a former industrial site into a community park that could accommodate excess rainwater and protect 2,000 residents against increasing flood risks. A key driver was the economic regulator for water supply companies which allowed allocation of funds from the water tariff to finance the climate change adaptation projects[19].

Policy, regulation, and finance can also drive innovation and create new business models for the management of wastewater discharged by urban users back into the catchment areas. This can be through recycling of water by industry and the trading of reused water between industry and municipal authorities. As presented in the Handbook, in the Indian state of Maharashtra, there are mechanisms being developed to promote the trading of recycled wastewater. It is expected that the tradable permit mechanism will maximize the use of wastewater treatment assets, mobilize financing for water infrastructure and disruptive technologies through private sector participation, and build institutional resilience through information technology-based innovations.

CITY-BASIN DIALOGUE AND THE SDGs

The Handbook provides a practical reference on how to respond to the call to action for urban stakeholders to play a greater role in engaging in their hydrological basins. It can be used as a source for policy recommendations, and as a reference for best practice for more active awareness and involvement from across urban areas to ensure water quality, flows and preparedness for extreme events. It also provides approaches for taking action which can contribute to the 2030 Sustainable Development Goals (SDGs).

SDG indicators have a global focus, but decisions around SDG6 ("Clean water and sanitation for all") are happening locally, across neighbourhoods, cities, aquifers and basins. Cities are crucial agents to deliver action on the SDGs which can secure health and well-being of citizens and the environment. Holistic approaches and cross-sectorial partnerships are important to develop water for smart liveable cities. At least 105 of the 169 SDG targets will not be reached without proper engagement and coordination with local and regional governments[20]. Furthermore, cities and regions are increasingly using the SDGs as a foundation to shape the design and implementation of urban strategies, policies and plans.

Cities need to engage and have active dialogue with stakeholders in their surrounding watersheds to achieve SDG targets across the different goals including SDG 6. In most countries, local governments are providers of water and sanitation facilities, or they oversee the provision of services through private sector partnerships. However, the responsibilities of the local government can include ensuring equitable distribution of water resources, identifying alternative sources, and supporting coordination with surrounding regions to secure supply and protect quality[21].

As cities use the SDGs to shape their policy and planning, interactions and trade-offs between different SDG targets need to be recognised, meaning there should be promotion of synergies across sectors. Actions to achieve SDGs can be designed to consider linkages – for example urban wastewater utilities can be operated to not only improve water quality, but also produce energy (SDG7 Affordable and clean energy), as well as contribute to SDG 11 – Sustainable cities and communities. At a city-basin scale local governments can contribute to SDG 6 through water-use efficiency by ensuring sustainable withdrawals and supply of freshwater within their source watersheds. This can be through implementing IWRM policies and initiatives which can contribute towards conservation practices and restoration of ecosystem (Goal 15 – Life on Land)[22]. SDGs provide the drive and direction for cities to use a systems approach in planning and implementation.

Interconnectedness is the essence of a basin-connected city, only by having a systemic approach can cities work in conjunction with their wider basins to effectively respond to different pressures. Understanding the linkages and the impacts of different actions means active cooperation and communication among stakeholders from catchment to tap. The Handbook on Basin-connected Cities, to be launched in 2022, provides an insight into how this is happening in practice, and demonstrates how different actors navigate amongst complexities to ensure sustainable basin management for upstream and downstream users.


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FOR MORE INFORMATION - CONTACT

To learn more about the Action Agenda for Basin-Connected Cities, please visit: https://iwa-network.org/projects/basin-action-agenda and https://www.inbo-news.org/en/documents/all-handbooks-basins-management

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