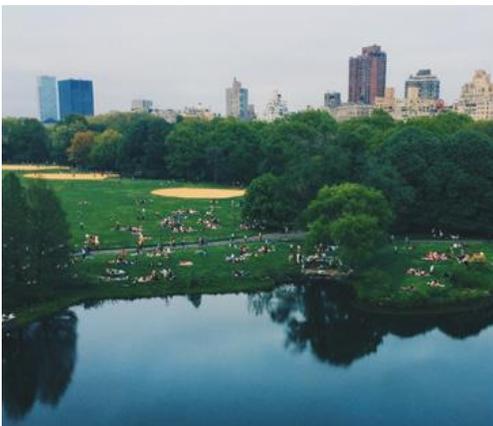


Basin-Connected Cities Forum

What actions by utilities, cities and industries can be taken today to achieve sustainable water management in the future?

Compiled by Mohammed Tawfik and Katharine Cross



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Executive summary

Context

Protecting basins and restoring those that are already degraded is a priority to ensure a balanced approach to development that sustains cities and the ecosystems they rely on. The Sustainable Development Goals (SDGs) focus on this, specifically through SDG6 which aims to ensure availability management of water and sanitation for all. Continuous socio-economic development for cities and industries within a catchment area requires water security which depends mainly on healthy basin ecosystems coupled with effective water governance. Urban stakeholders have a critical role to play in preserving the freshwater resources on which they depend. A disruption in supply of freshwater resources to cities can have significant economic, environmental and health consequences.

Challenges related to water quality, quantity and resilience to extreme events cannot be solved by individual entities alone, as the wider catchment is usually beyond their mandate. Utilities and city governments can play leading roles, but must also engage with basin stakeholders representing environmental, social, and economic interests.

Connecting Cities with their Basins

What actions by utilities, cities and industries need to be taken today to achieve sustainable management of basins into the future?

Cities can play a leading role in investments in their watershed combined with urban projects that protect water management and recovery by integrating urban drainage, sewage infrastructure, restoring plant cover and water sensitive design in the urbanization of surrounding settlements, as well as their local reservoirs, such as lakes streams and ponds.

Such actions together can increase water security and become key risk prevention strategies for dealing with degrading water quality, water scarcity and extreme events such as floods and droughts.

Building on the Principles for Water-Wise Cities, the Action Agenda for Basin-Connected Cities aims to influence and activate utilities, cities and their industries to become water stewards working with basin and catchment organisations. The Agenda outlines the rationale for urban stakeholders to lead the way in realizing their role as water stewards and the different pathways and activities towards achieving sustainable water management. This includes the **Drivers for Action** such as extreme events, declining water quality, and water availability; followed by the **Pathways to Action** through assessment, planning and implementation; and the **Foundations for Action** from developing a vision to building capacity to improving governance.

The Action Agenda provides a framework to showcase both successes and setbacks which demonstrate the vision of actively engaging urban stakeholders in water resources management. The framework is being populated with Basin Stories aiming to inspire urban end users to be aware and respond to what is happening in their watershed.

Overview - the Basin-Connected Cities Forum

The [Basin-Connected Cities Forum](#) followed the launch of the [Action Agenda for Basin-Connected Cities](#) which aims to influence and activates urban stakeholders to protect and invest in water resources with basin and catchment organisations. The Forum was a mixture of keynote, panels and active roundtable discussions which looked at firstly, the transformation needed to enable basin-connected cities, and secondly the tools for action to make this happen. Common challenges identified include the siloed approach to water and land management, short-term returns prioritized over long-term investments, and sustainable funding mechanisms.

Key recommendations

- A **holistic, integrated approach** which considers the whole water cycle – surface water, rain water, groundwater, reused water, etc. Only by having a **systems approach** can cities work in conjunction with their wider basins to effectively respond to different pressures.
- **Cooperation** among stakeholders from catchment to tap for successful transition to Basin-Connected Cities.
- **Communication** is the foundation to co-operation across sectors, sharing of information, and creating an environment for inclusive community engagement
- Effective **capacity building** through education, awareness and knowledge tools encourages communities to self-organise and take decisions including committing to long term plans to connect with their basins.
- **Proactive rather than reactive response and planning** is needed, while recognizing slow and prudent innovation is more deliberate than if it is a response to a crisis or emergency situation.
- Investment in innovative city-basin connections from government can appear limited; however this is where **partnership with the private sector** is important.
- Small amounts of investment in watershed management with urban stakeholders can have **impact if spent on the right projects**, as they can **provide the evidence base** for decision makers to scale –up.
- Space for stakeholders to go beyond their prescribed mandate if needed through **flexible policy and regulatory frameworks**.

Session 1 – Transition to Basin-Connected Cities – Urban Perspectives

Chairperson: Claudia Sadoff, IWMI

Facilitator: Katerina Schilling, IAWD

The Forum was opened by **Diane D’Arras, IWA President**. The first session focused on the transition to basin-connected cities, and a panel was chaired by Claudia Sadoff, IWMI sharing experiences from Paris (Frederique Denis, SIAAP), Kampala (Rose Kagwaa, National Water and Sewerage Company), Melbourne (Kirsten Shelly, Melbourne Water), Tokyo (Ishida Norihiko, Tokyo Metropolitan Government), and cases from Suez (Mathieu de Kervenael, Suez Environment). This was followed by roundtable discussions moderated by city and utility representatives from across the globe. This session was facilitated by Katerina Schilling, IAWD.

Opening - Diane D’Arras, IWA President

Building on the Principles for Water Wise Cities, the Action Agenda for Basin-Connected Cities aims to influence and activate utilities, cities and their industries to become water stewards working with basin and catchment organisations. The Action Agenda outlines the Drivers for Action such as extreme events, declining water quality, and water availability; followed by the Pathways to Action through assessment, planning and implementation; and the Foundations for Action from developing a vision to building capacity to improving governance. The agenda was launched yesterday and is a basis for the Basin-Connected Cities Forum.

Water resources are under continuous pressure mainly due to population growth – According to the UN by 2050; two out of every three people are likely to be living in cities or other urban centres, thus the need for more sustainable planning and services. Continued socio-economic development for cities and industries within a catchment area requires water security which depends mainly on healthy basin ecosystems coupled with effective water governance.

Urban stakeholders have to play an active role in preserving the freshwater resources on which they rely for their survival/existence. Urban stakeholders of a water basin have a critical role to play in preserving the freshwater resources on which they depend, and to do this must look beyond the city boundaries into their basins

The Basin-Connected Cities Forum explores what actions by cities need to be taken today to achieve sustainable management of basins into the future. We look forward to an interactive Forum with cases and lessons to be shared around the world; we encourage you to play an active role in the Forum and beyond.

Session 1 - Panel discussion

Pathways to Action - Kirsten Shelly, Manager Catchments and Water Quality, Melbourne Water, Australia

How Melbourne Water is committed to making sure the city and its surrounding continues to thrive while adapting to climate change, urbanisation and population growth. See [presentation](#).

Discussion Question - What are the hurdles you have had to overcome to connect organisations across the catchment, and how has this been navigated?

Melbourne, the state capital of Victoria and Australia’s second biggest city, is in a variable climate; it is becoming hotter, drier, and facing more periods of extreme weather events such as: heat, drought, reductions in annual rainfall and increases in intense rainfall events, sea level rise, and an increased risk of flood and bushfire. These lead to new challenges such as: changing vegetation, increase of invasive species, and increasing of health impacts related to urban heat.

Population modelling shows that Melbourne will likely grow and undergo transformations rivalling the changes driven by the gold rush and post-war booms, adding 70,000 new dwellings per year. A drier climate in an increasingly paved landscape poses a very real threat to the long-term values of our waterways, while at the same time increasing the importance of those waterways as a green and cool respite from the urban landscape.

As a leader in world class integrated water, sewerage, waterways and amenity management, Melbourne Water is committed to guarantee that Melbourne and surrounds continue to thrive while adapting to climate change, urbanisation and population growth. Melbourne Water’s story is one of pathways to action that help urban stakeholders be better connected with their watersheds, including securing the water resource, protecting waterways and preparing (and responding) to extreme events.

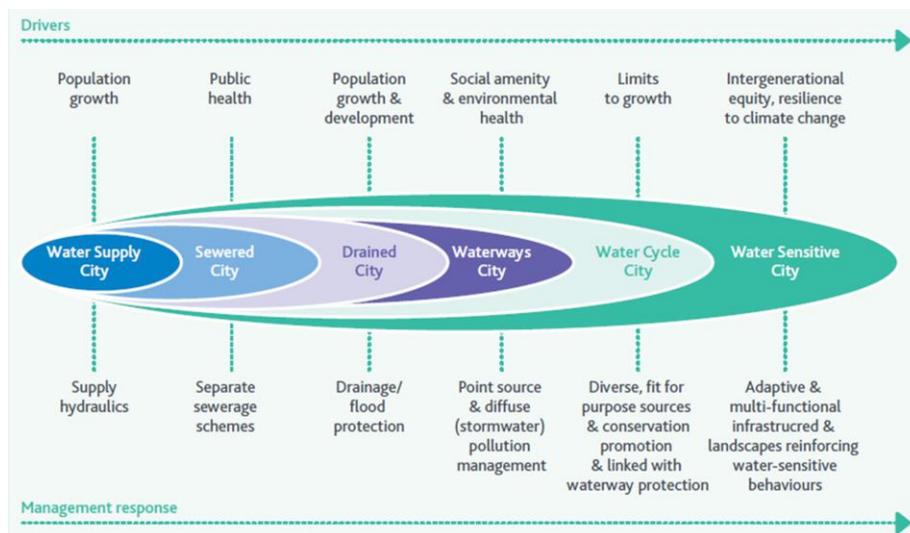


Figure 1 Melbourne towards a water sensitive city - illustrative diagram of drivers for action and management responses

Managing water hazards from catchment to tap - Ishida Norihiko, Director, Tokyo Metropolitan Government - Bureau of Waterworks, Japan

Tokyo Metropolitan Government and five prefectures have structured a “liaison council” in order to prepare against water quality hazards and droughts which impact the surrounding basins they rely on. See [presentation](#).

Discussion Question - *What specific actions have the liaison council (for the Tone and Arakawa River systems) undertaken to prepare against water quality hazards and drought?*

The Tokyo capital region has Tone and Arakawa River systems, which provide approximately 80% of water resources in Tokyo. There are one metropolitan and five prefectures in the basin. The metropolitan and five prefectures have structured a “liaison council” in order to prepare against water quality hazards and droughts which impact the entire basin. Moreover, Tokyo Metropolitan Government (hereinafter referred to as, “TMG”) shares information regularly. By means of cross-jurisdictional that utilizes a liaison council in case of emergency. TMG implements quick and appropriate responses. In addition to such approaches, TMG implements the following type of initiatives:

1. In the case of hazards which may negatively affect water quality, TMG responds in accordance with its “Water Safety Plan[※]” approach and minimizes the impact.

** A water safety plan is a plan to ensure the safety of drinking water through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer. Water safety plans are considered by the WHO as the most effective means of maintaining a safe supply of drinking water to the public.*

2. TMG has introduced new treatment which utilizes ozone and biological activated carbon to respond to substances which cannot be removed and reduced by conventional water treatment.

TMG improves functions of water conservation of water resources, prevention of soil run off, and purification of water quality in the Tamagawa River system, which is further upstream of Tokyo’s own water resource. TMG has also mitigated floods by controlling the flows to rivers.

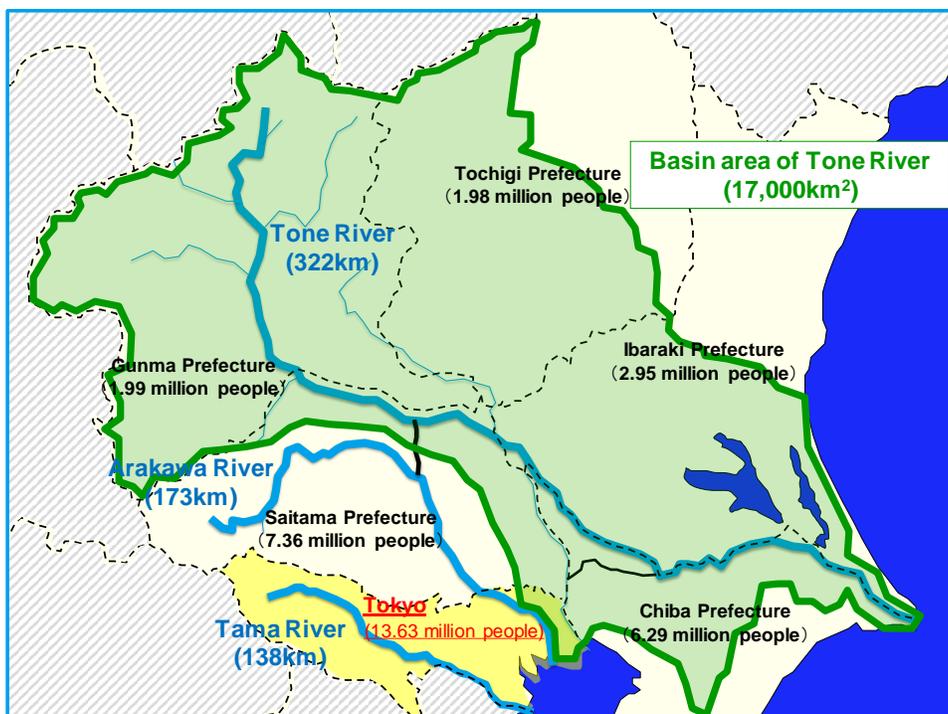


Figure 2 Connecting Tokyo to its basin, map showing the basin that provides Tokyo with its water.

Managed Aquifer Recharge - Mathieu de Kervenael, Head of Global Strategy & Development, Suez Environment, France

The Beenyup case study in Western Australia focuses on the coupling of water infrastructure and aquifers by aiming to recharge the local water cycle. Managed Aquifer Recharge (MAR) includes different applications such as wastewater reuse, surface water reuse and sea water barriers against salts intrusion. See [presentation](#).

Discussion Question - What are some of the challenges of managed aquifer recharge in a city? And how to overcome those challenges?

The aim of this project is to couple water infrastructure and aquifers to recharge the water cycle. Managed Aquifer Recharge (MAR) includes different applications such as: wastewater reuse, surface water reuse, and sea water barriers against salts intrusion. All schemes aim to recharge the aquifer(s) of the water basins(s) of any given city. For such cities, the project driver is to seek rainfall independence by recycling water for aquifer replenishment in order to serve as seasonal water storage backup that could be used for drinking water purposes.

“Beenyup water recycling plant” case study of the Water Corporation in Australia, to review and highlight key success factors of MAR particularly when it is coupled with wastewater reuse.

Key success factors:

- Appropriate treatment processes to be implemented, in order to reach the required quality standards for water reuse and/or get the required “microbial log reduction credits”: there is now a strong understanding of the pre-requisites for, and technical

feasibility of different types of “managed aquifer recharge” (MAR) schemes, depending on water sources, aquifer types, and end uses. Therefore, there is now a high degree of confidence around health & environment implications of MAR schemes.

- Long-term planning for phased implementation. Trials conducted from 2010 to 2012 to fundamentally prove the concept, evaluated by regulatory agencies and finally endorsed by Western Australia government; Phase I for 40 MLD over 2014-2016; Phase II for additional 40 MLD over 2017-2018.
- Public outreach & education: there is strong community support where certain standards of community consultation & engagement have been achieved.

Accordingly, water management plans should systematically consider the MAR alternative at conceptual & feasibility stages. It is also recommended to couple MAR with reused water, where MAR offers a safe, sustainable and cost-effective solution for the benefits of the local water cycle management within cities.

Aquifer recharge from water reuse can only be one lever of a wider water management plan, which shall also include water conservancy measures (reduced water consumption, reduced water leakages/losses in distribution systems).

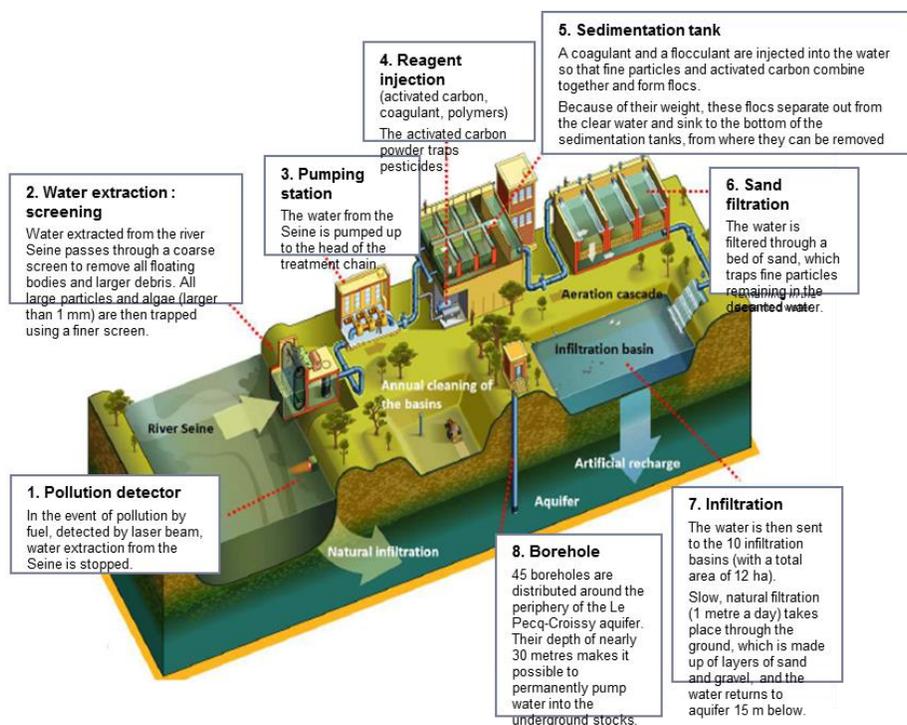


Figure 3 Aquifer recharge - from surface water Seine River in Paris

Key messages

Key success factors for aquifer recharge from water reuse are long-term planning, public outreach & education, phased implementation with pilot tests / trials.

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- “Beenyup advanced water recycling plant: The Perth Australian “ground water replenishment scheme” Presentation to the IDA water reuse & desalination Conference, Nice, Sept. 2016; by Kevin Guppy, Water Corporation.

Water resources management in Paris and the River Seine catchment - Frederique Denis, Departmental Advisor, SIAAP, Paris, France.

Discussion Question - *In your opinion, as an elected person, how can a more holistic approach change the behaviour of users in their daily actions towards their environment?*

France has a long tradition of integrated water resources management that promotion of the connection between cities and their basins. In the case of Paris region and the River Seine catchment, the watershed integrated management has been implemented since the Water Act of 1964 providing an efficient frame to connect the megacity of Paris to the Seine river catchment. Integrated water resource management is overseen by two organizations: the Basin Committee and the Water Agency. In France there are six main catchments organisations, one of which is the Seine Normandy Catchment.

Basin committees are a kind of water parliament where water management policy is discussed by the water users with representatives of cities, industrials, farmers, fishers, environment and consumers associations, State authorities, etc. The result is a multiyear Water Development and Management Master Plan or in French: Schéma Directeur d’Aménagement et de Gestion des Eaux – SDAGE. Related to this Master Plan, the Water Agency proposes a multiyear program to provide financial support to most of the measures of the Master Plan.

An example of a comprehensive approach is on phosphorus and ammonia concentration management in the River Seine related to SIAAP’s Sanitation system performances. The 2010 - 2015 Water Development and Management Master Plan stated the phosphorus and ammonia pollutant load sharing between Paris region and the upstream to fulfil the achievement of the good status required by the European Water Framework Directive for River Seine quality in its downstream section.

Lower concentrations of phosphorus and ammonia than those required for good status were imposed in the SDAGE upstream of the Paris region for River Seine and its main tributaries. This made it possible to offer a better dilution potential for SIAAP’ wastewater treatment plants discharges, thus allowing optimization of investment costs.

Another example is on flow regulation obtained with large dams located upstream on the River Seine and River Marne. These dams were planned and built for flood control in winter and low flow alleviation in summer and autumn. This last objective is important for drinking water supply, power production and treated sewage dilution.

Those two examples show how the Paris region is connected to its basin thanks to the French integrated water resource management policy.

Leveraging Private-Private sector participation in wastewater and faecal sludge management - Rose Kaggwa, Director Business and Scientific Services, National Water and Sewerage Corporation, Uganda

Discussion Question - *What are the drivers that interest the private sector to address wastewater and the impacts it might have downstream?*

Kampala, the Capital City of Uganda has a resident population of 1.5 million which doubles due to high influx of transient population. The city relies on Lake Victoria as the source for piped water supply besides other ecosystem services. Over the past 4 decades the lake ecosystem has undergone excessive pollution and catchment degradation pressure due to rapid urbanization and industrialization coupled with inadequate sanitation and defective wastewater management. Since 2012, KCCA in collaboration with NWSC and Ministry of Water and Environment (MWE) initiated the Kampala Pollution Task Force with an overall objective of establishing a strong Public-Private Partnership framework for reducing wastewater and faecal sludge induced pollution resulting from industrial processes and inadequate on-site sanitation systems.

Key interventions in this program have mainly focused on:

- (i) Strengthening the regulatory and institutional collaboration among key government institutions with mandate on sanitation and wastewater management.
- (ii) Establishing Public-Private sector collaboration in reducing pollution through dialogues, compliance assistance programs, technical trainings, benchmarks, peer to peer learning, and joint monitoring.
- (iii) Supporting private sector entrepreneurs involved in waste management and sanitation services to upscale access to improved on-site wastewater treatment and faecal sludge management services.
- (iv) Up scaling public awareness and sanitation marketing campaigns to involve communities and local leaders in investment and adoption of improved sanitation.
- (v) Investment in strategic infrastructure including wastewater treatment plants, expansion of sewer network, solid waste management, drainage systems and public sanitation facilities.

Key Results since 2012 are: Increased safely managed faecal sludge from 43% to 60%, increased capacity of wastewater treatment from less than 2000 cubic meters to over 8,000 cubic meters, increased collaboration between regulatory agencies, private sector and communities in waste management, and established forums for knowledge exchange, joint planning and peer to peer learning such as the annual Kampala Water.

Lessons learned

Leveraging private sector participation is critical in building a common understanding in water resources management and pollution control especially when the investment objectives and co-benefits to the business and operational environment are clear. This requires commitment, transparency and building trust among all actors. Programs need to involve local community leaders as part of trust building process and to create ownership of program's activities for long term sustainability.

Key messages:

- Starting on a small scale is crucial to demonstrate benefits.
- Participation, Collaboration and partnership at all levels are crucial successful investments and to build water stewardship in cities.

Session 1 - Roundtable discussion

The roundtable discussion was organised to provide a platform for discussing a range of topics related to the main theme of the first session, where each roundtable has a moderator who will present a case study for 5 minutes and then lead a discussion using the guiding question provided.

DESIGNING WITH NATURE: Nature, water and the circular economy

Moderator – Francis Pamminger, Manager Research and Innovation at Yarra Valley Water, Australia

Our traditional water and sanitation systems have been designed as linear processes, where we harvest water from a catchment then pipe it to our consumers, the same applies for wastewater, we collect wastewater and send it off downstream for treatment and disposal. Nature doesn't do this, look at the human body that is 70% water and yet only needs about 2 litres of water a day to function, it does this by recycling and reusing water up to twenty times within the body. A more efficient water cycle would recycle more; look at Singapore that recycles 40% of its water.

A common principle used in the design of our traditional water and sanitation systems is the economy of scale. Such thinking leads to large sources of water supply and sewerage treatment facilities, which is good for reducing costs, but rather brittle to external shocks such as droughts. Nature is more resilient, it handles climate variability better. Anyone having walked through the Australian bush after a fire would notice that many plants need the fire to crack their seeds for regrowth. For an example of a more resilient supply system, I will point to Singapore. It has designed its water supply system to get its water from four different sources, external catchment, local catchment, recycling, and desalination.

Many of our urban water solutions are not aesthetically pleasing. Think of a bland functional pump station building or a sewage treatment plant that people do not want to live beside. On the other hand we all feel better in nature that is why we tend to be outdoors more often, this is called biophilic – which is our innate tendency to seek connections with nature and other forms of life. This is a health and wellbeing element, and a fundamental building block to liveability. More aesthetically water infrastructure would have more greenspace inside cities like in Seoul.

Finally, we need our water and sanitation systems to be sustainable, as per Stockholm Resilience Institute findings, highlighting that we are not sustainable in three of our nine fundamental planetary boundary conditions required to maintain earth's safe operating space and support contemporary society. We need to adopt a regenerative approach e.g. an apple tree does not just produce one flower, to grow one apple, to get one seed to replace it with another single tree, but it produces many flowers, which needs bees to pollinate before they

grow into a tree full of apples that feeds many others and the surplus decays to provide nutrients into the ground for further growth. We now need to think more widely of the interconnection of our water and sanitation systems, and the many other benefits they can provide. A regenerative water supply system would provide multiple benefits to multiple stakeholders. Think of a sewage treatment plant such as in Roseburg Oregon that includes wetlands in the treatment process, and has a board walk for visitors to come enjoy.

Cities are now the predominant locations for humans to live and we have choices in how we contribute to our future cities. I recommend that we change our thinking to recognise that we are part of nature, and think of how we can better design our systems to equally be part of nature. Nature can teach us to design our water and sanitation systems to be more efficient, more resilient, provides more delight, and become regenerative.

Summary of Roundtable discussion

***Discussion Question** - What could a city urban water cycle look like if it was designed as part of nature, rather than trying to control nature? It would be more efficient, more resilient, provide more delight and would be regenerative.*

Nature Based Solutions have enormous benefits. However, there is a need to communicate those benefits among the various stakeholders in order to show how NBS could offer realistic solutions for future needs. The role of organisations such as IWA is important to use its broad network to promote and communicate such solutions on different levels; most importantly among urban stakeholders. Nature Based Solutions are context specific. Therefore, cities might be classified; for example according to their climatic conditions and what type of NBS could improve resilience, such classification will need a holistic planning approach. Finally, all stakeholders including community and local representatives need to share the same vision regarding the role of: built environment, natural environment and new and existing development.

REGULATION: Regulatory incentives for basin-connected cities (London)

Moderator – Trevor Bishop, Director Strategy and Policy, OFWAT, UK

One of the biggest challenges for connected cities with their basins is the alignment of the complex and sometimes competing interests of stakeholders, institutions, governance arrangements and investment bodies. Creating a common purpose, coordinating actions and aligning regulatory incentives can often be an important challenge which will influence the ability of people, the economy and the environment to adapt and thrive into the future.

This roundtable discussion explored how regulators can play an active role in helping to better connect cities and basins. The table will focus on the use of both regulatory incentives but also the role regulators can play in helping to coordinate across disconnected parties and negotiate for joint action.

Summary of the roundtable discussion

Discussion Question - *What are regulatory incentives needed to achieve a sustainable transition to basin-connected cities?*

The role of regulators includes developing methods that actively incentivize utilities to adopt approaches that include co-financing and cross subsidies to enable green solution. However, there is a need for an agreed methodology to evaluate these solutions through cost-benefit analysis for example. Providing an evidence base means there is a possibility to increase acceptance and increase willingness to invest in nature based solutions that connect basins and their cities. Incentives for utilities are beyond regulation; other incentives might be represented in customer-drive solutions and community engagement in implementing solutions which is essential to sustainability. Finally, there are strategies beyond water services which leverage a circular economy approach such as resource recovery to generate income and reduce costs.

GOVERNANCE: Governing at the watershed level: limits of traditional coordination tools, promises of innovative approaches? (Paris)

Moderator – Benjamin Gestin, General Manager, Eau de Paris, France

Watersheds require a coordinated management approach in order to respond to the challenges of growing urban areas in the context of climate change; this belief is shared by most of the water community. However, the water community must address many obstacles before achieving their goal. Among these obstacles, governance issues are maybe the most prominent.

The Paris and Seine River basin example shows that in spite of decades-long experience of basin-level management of water resources and the constant efforts of dedicated watershed management organizations (e.g. water agency of the Seine basin), much is left to do to prepare for stronger and more frequent extreme weather conditions (rainstorms, floods, droughts) or increasing water use related conflicts (farming, drinking water, energy). The multiplicity of local authorities involved in the management of water within the watershed and the fact that their territorial purview does not follow any hydrographical lines remain in many cases a major issue. Building capacity to address the upcoming challenges should also be a priority but the question can be raised of where to build this capacity and how to work efficiently as a network. The role of the national authorities in streamlining this delicate coordination can also be debated.

Traditional coordination tools such as: urban planning framework documents, regulatory systems, and contingency management processes are useful. However, this still needs to be improved and/or generalized. Best practices in this field could be shared. More innovative approaches may change the game in the coming years, innovations like knowledge-based approach, big data, participatory approaches or dissemination and incentivizing of micro initiatives already complement the usual institutional responses.

Lessons learned

- We need to improve and leverage coordination tools to integrate watershed management: urban planning, better coordination of stakeholders, regulatory frameworks and enforcement.

- Relevance of creating a stronger consensus through science-based approach and participation (institutional, general public).

Key messages

- “You’ll never walk alone”: addressing the challenges of watershed management is a team work.
- The “soft skills” approach as much needed as the hard infrastructure, especially in densely urbanized areas.

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Summary of Roundtable discussion

Discussion Question - *In many jurisdictions, there are multiple water authorities with overlapping mandates. What experiences can you share in approaches for better coordination – both successes and failures?*

Flood control is one of the most persistent problems in river basin management and needs collaboration between basin organisations upstream and end users downstream, in particular water utilities. This collaboration has to be based on interdisciplinary research and work in order to provide inclusive solutions for rural and urban settings. The experience of SIAPP in the city of Paris is an example of inclusive river basin management, where the new master plan for water services has been developed in collaboration between utilities and basin committee, which is a body bringing together stakeholders across the basin. This master plan set standards for water quality and is legally binding.

BEYOND POLICY: Managing water sources beyond policy frameworks, Nairobi, Kenya **Moderator – Elizabeth W. Mwangi, Nairobi Water, Kenya**

Context

The Water Resources Authority in Kenya is responsible for watershed management and conservation. On the other hand Water Utilities like Nairobi Water and Sewerage Company are only expected to pay extraction fee of \$0.005 per cubic meter as per the policy framework.

Beyond the expected requirement, the company understands the dependency of its services on the catchment area especially in cost of service provision, quantity and quality of water and

sanitation service provision. Nairobi Water therefore has undertaken services beyond the policy requirement by adopting the IWA Water –Wise principles.

- 1) Regenerative Water Services: Nairobi water had adopted demand control through public awareness using media campaigns (water saving tips), National water conferences, water forums etc. The company has been reducing the amount of energy requirement for water production by adopting solar energy use for sewer treatment and currently exploring ways of using solar energy for water treatment. To reduce the use of energy in water supply, the organization uses gravity to supply water instead of pumping.
- 2) Water Sensitive Urban Design: The requirement of conducting environment assessment for all water projects and stakeholder's participation from planning, design and implementation benefits in mitigating and reducing disaster e.g. Flood and drought.
- 3) Basin Connected Cities: Nairobi Water realizes the effect of catchment riparian communities in sustainable supply of water and sanitation services. Through collaboration with government agencies working in the watershed areas, non-state players e.g. The Nature Conservancy and small-scale farmers, the company ensures proper management and conservation. The company has developed and adopted risk management plan for catchment areas that include stakeholder's participation and contribution.
- 4) Water-Wise Communities: Stakeholders involvement promotes policy dissemination and uptake of community ideas to policy. The water Act 2002 and 2016 has given a clear integration process and system for basin to tap process. Inter sector discussions are also key in ensuring and cohesive water management and planning system

Challenges

Governance structure and policy on water resources management limits utility participation in catchment management.

Contribution to Water Resource Management fund does not guarantee a successful catchment management that is inclusive for utilities in the regulatory process. Since the company has no direct mandate in conservation, it cannot enforce the conformity from other player and introduction of new regulations are dependent on good will.

The government support is dependent on agencies with mandate to conserve and preserve the catchment areas and when there is conflict, it is difficult to resolve.

Elements of Success

- 1) Increased water yields,
- 2) Reduced sediment loadings, (reducing the cost of desilting and overflows).
- 3) Sustainable food production in the catchment areas (Reducing interference with the dam).
- 4) Increased household incomes in farming communities in the riparian (Reduce the pressure in security and conflict).
- 5) Non-monetized benefits, including increased pollinator habitat and carbon storage.
- 6) High perforation in the catchment areas (Important for sustaining the dam in dry seasons).

7) Resilient water supply to climate change impacts.

Lessons learned

Catchment management of the areas has a direct impact to water provision and sustainability in the city. Existing policy and governance structures are necessary but not sufficient to protect the catchment area for sufficient water supply since the objectives may not be consistent with the water utility requirements.

The utilities have to go beyond the described mandate to align the water resource management to the planning and operations system of the company.

Key messages

Water utilities need to be directly involved in management of watersheds even when the policy framework excludes them.

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Water Act 2002, and 2016. Water Resources Authority (Kenya), Ministry of Water and Irrigation. Nairobi City Water and Strategic plan, Upper Tana Water fund (Nature Conservancy).

Summary of Roundtable discussion

Discussion Question - *How can stakeholders be effectively engaged in risk management plans for catchment areas?*

Nairobi water gets its water from more than 100 km away. However, the regulatory framework doesn't allow the company to manage the catchment area, but the risk in the catchment could affect the company's water resources; these risks are: poor environmental management leading to pollution and sedimentation downstream, and poor stakeholder engagement. Therefore, Nairobi water has established a 'working-environment' with the farmers in the catchment in order to inform them about sustainable farming practices that will have positive impacts on water quality. Nairobi water has established a partnership with TNC as well in order to bring other stakeholders on board.

From this case we conclude that scale is very important in basin, river and water resources management, there is also a need to understand the different needs for all stakeholders and compensate those affected when required; this could be done by stakeholder engagement platform to enable them managing the risks, identify common benefits, awareness of risks and ownership of solutions. Stakeholders can feel if they feel the consequences of the risks. For inclusive and successful basin management it is important to have flexible policy and regulatory framework that enables stakeholders to work beyond their prescribed mandates.

STAKEHOLDER ENGAGEMENT: Living with Water – Engaging communities to thrive on it, not fear it!

Moderator - Lee Michael Pitcher – Yorkshire Water, UK

Context

The City of Hull, located in Yorkshire, United Kingdom, has a population of more than 300,000. The city has always had a relationship with water be it as one of the UK's largest ports or how it grew from the fishing industry and the farming of high quality agricultural land from drained marshes. A rich history from being given a Royal Charter by Edward I in the 12th century or as home to William Wilberforce who drove the abolition of slavery act has played its part in Hull being the UK's current City of Culture.

More than 90% of the city sits below the high tide line and is 100% reliant on pumping to reduce flooding. Whilst significant investment and progress has been delivered since the 2007 floods where more than 20,000 people were flooded, the city still remains the second biggest flood risk in the United Kingdom outside of the Thames estuary area.

As such the "Living with Water Partnership" was recently formed with four principle partnership leads; Hull City Council, the East Riding of Yorkshire Council, the Environment Agency and Yorkshire Water. They have agreed to work collaboratively to deliver the Board's vision: to create a thriving community in Hull and Haltemprice through working together on flood risk management to become an international exemplar for living in harmony with water.

The partnership's contribution will facilitate Hull becoming a sustainable city, protected from climate change with a thriving 21st century economy predicated on the relationship with water in the city and surrounding areas.

Yorkshire Water's Head of Resilience Lee Pitcher has recently been appointed as the General Manager and tasked to drive the implementation of the strategy. One of the key challenges is how to re-connect and re-engage the communities to not fear water but live with it as an amenity that allows them, and the city, to thrive and prosper.

This presentation will talk about how the partnership has approached this innovatively to inspire and engage all communities to drive forward resilience at an individual, community, national and global level.

References

www.livingwithwater.co.uk; The HLL-TIMATE challenge –
<https://www.facebook.com/events/1771901912859409/ti=ia>

Summary of Roundtable discussion

Discussion Question - *What innovative ways have you engaged across partnerships or communities to share learning and build resilience?*

Hull is a city of about 400,000 people and the 3rd poorest area in the UK. Ninety percent of its area sits under the high tide level (sits in a bowl), and when it rains there is no way for the water to get out. Therefore, the city relies on pumping and faces to mitigate flooding risks.

Since 2011, the local authority, environmental agency, and water utility, started a partnership to invest in the city water-related challenges; assessing new pumping stations, treatment works, etc. to improve resilience in the city.

Ten years on Hull City is still the second most prone to flooding in the UK (London is first but has a barrier to protect), stakeholders in the city started to explore ways to engage with the community; among these ways are:

- Education – for the children so in the future more sustainable way forward – Soak it up – go to schools and show children and teachers how to remove surface water through practical example – use it for watering plants, in ponds (educate about the water cycle). Also engaging with Education authority
- Wider community – 30 NGOs, charity, local community activities – Ultimate challenge – obstacle race (3 days) through the city each obstacle is flood related the goal was to teach about sustainable urban draining, show them not to fear water.

Other examples of engagement and building partnerships for water:

The city of Rotterdam; the city vision is to have Strong community, strong partner and a passionate influencer, this vision was materialised in engaging the community in using storm water for non-drinking purposes, the influencer was the popular local soccer team (Sparta) to encourage local people to adopt the city vision..

Key messages

1. Strong community, strong partner, and passionate influencer
2. Listening, responding to their needs (demand driven), having on ground presence, capacity building
3. Communities being able to be self-organised and ability to take decisions, etc.
4. Push away from reactive engagement towards proactive engagement
5. Engage bottom-up (the communities, understand what they need and want, education, tools, knowledge)

FLOODING: Addressing coastal and riverine flooding (Copenhagen)

Moderator - Trine Stausgaard Munk, Project Manager, Ramboll, Copenhagen, Denmark

In recent years climate adaptation has received extreme attention in terms of management of unprecedented rainfalls in urban settings. However, cities are increasingly also looking towards coastal and riverine flood protection. Adapting to sea level rise, storm surges and fluvial flooding will be driving political agendas in the coming years , presenting similar challenges as adapting to extreme rainfalls, but also new complexities as this management aspect often does not lie naturally within one city agency, actor or organization.

This group explored how cities can address the key challenges related to coastal and riverine flooding in a coordinated and collaborative way. The group discussion focused on the actual climate change challenge itself, and the challenge of connecting city-lead efforts through a basin-wide approach.

Summary of Roundtable discussion

Discussion Question - *How can city-basin connectivity improve resilience to the impacts of coastal and riverine flooding on cities?*

Understanding combined events and how we design to address climate change is possible through the use of Nature Based Solutions; an example of combined events is how the basin and the coast interact. Nature based solutions can be feasible options to deal with complex ecological systems and unpredictable climate change related events but they are not applicable everywhere.

CAPACITY BUILDING: Utilities working together across a basin (Danube)

Moderator - Walter Kling, President, IAWD, Austria

IAWD as a knowledge exchange platform developed over the last 25 years. This experience also shows how integrated water management in river basins changed over decades of development. The Danube region is an outstanding international river basin, the most international one by number of countries. The extension of the EU in this area changed the approach in this area and will now be extended to the counties of the Balkan region. IAWD runs a capacity building program in the river basin over the last 6 years, launched jointly with World Bank. Out of our experience, well developed knowledge of utility-staff in the region will secure a better development of the water sector working together in the Danube catchment area.

Summary of Roundtable discussion

Discussion Question - *How can utilities work together across an international basin to improve water quality, reduce flooding impacts and manage water scarcity?*

Danube is an international river running through diverse economies and cultures bridging diverse approaches and /or creating conflict. Issues of conflict around the basin (e.g. civil war former Yugoslavia) led the association to join forces with utilities to engage people in a common discussion. The most important question that was asked is whether capacity building can bring results across cities sharing the same basin? In answering this question a number of important factors need to be addressed as well including the importance of having a form of leadership across the basin represented by the biggest water utilities (i.e. champion utility) to drive change strategy and agenda across the basin. Networking and communication across stakeholders is essential to create credibility and transparency; and linking urban water cycle to different scales of watershed and adjoining basins.

TECHNOLOGY: Piloting satellite technology for catchment management (Philippines)

Moderator - Yang Villa, Senior Manager for Public-Private Partnerships, Metro Pacific Water, Philippines

We piloted Rezatec, a geo-spatial satellite service, over 2 water sources: Laguna Lake (Metro Manila) and Maasin watershed (Iloilo, southern Luzon). Our primary aim was to understand the value of improved catchment intelligence to our water source and production operations. If successful, we wanted to leverage the technology to build stronger partnerships with government agencies and other stakeholders towards improved catchment management. The key challenges in pilot implementation were funding (overcome through MPW financing) and lack of robust on-ground data. See additional information [here](#).

Lessons learned

(1) Technology is changing the way we understand and manage catchments. The pilot revealed several aspects of the catchments that would remain unnoticed / overlooked by traditional monitoring methods.

(2) Stakeholder communication is key to translating knowledge into action. Big data can be intimidating, and the best way to maximize its use is to encourage open access to more stakeholders.

Key messages

(1) Understand the driver for innovation: Why is it important to change the way we do catchment management?

(2) Key champions can de-risk innovation: Who can take the first step, and how can others follow?

References

Press release: <https://www.rezatec.com/rezatec-expands-into-south-east-asia-metro-pacific-water/>?

Summary of Roundtable discussion

Discussion Question - *How are smart water management solutions including satellite technology changing the way catchments are managed?*

Piloting helps to minimize and mitigate risks of innovative projects. Therefore, encouraging the private sector to invest and innovate within the water sector is essential. Private sector cooperation is required for success, as the government's limited resources and capability is not enough for a complete Basin-Connected Cities agenda and there is an obvious need for innovative financing in funding more programs at the basin scale. Even small capital can be impactful, too, if spent on the right projects.

BUILDING WITH NATURE: Working with nature to provide room for the river - New Clark City (NCC) River Study (Philippines)

Moderator - Nena Radoc, Senior Vice President and Chief Financial Officer (CFO), Bases Conversion and Development Authority (BCDA), Philippines

Protection of rivers leads to economic and environmental benefits, and to sustaining the quality and quantity of freshwater resources in watersheds. However, typical growth in Asian cities moves rivers to be heavily channelized, leaving minimal opportunity for multi-benefit green space in the cities. The New Clark City (NCC) River Study in the Philippines was aimed at supporting evidence-based decision-making on the potential of the river and the green space surrounding it to become integral to urban resilience and recreation.

This descriptive-analytical study evaluated the NCC's planned systems and their inter-linkages through the assessments of climate risks, vulnerabilities of anticipated assets, local topography and hydrology.

The study found that the proposed engineering solutions for the greenfield city do not allow for leveraging the river as one of the most beautiful natural features and assets of the site. Those solutions required massive amounts of earthworks and future maintenance, and the drainage capacity may not be sufficient to mitigate climate change impacts e.g. floods.

By exploring the synergies between physical planning, economic feasibility, and infrastructure engineering, the River Study recommended giving room to the river to help NCC achieve its vision of becoming a smart, green, and disaster-resilient city. Deliberate articulation of river edge conditions, at multiple scales, must be a key consideration throughout the NCC planning and development process, in particular in providing certain urban functions and ecological services.

The building with nature alternative approach prevents ill-planned river alignments thereby minimizing risks. Furthermore, there is strong economic rationale due to significant cost savings as a result of reduced earthworks and ecological modification and from the future savings in the form of mitigated damages caused by flooding.

Summary of Roundtable discussion

Discussion Question - *What drivers and evidence is needed to use nature based solutions to manage urban rivers?*

Development of New Clark City in the Philippines was reviewed by the Asian Development Bank (ADB) and has been criticized because planning doesn't respect the river's natural flow. Therefore, the development has to be taken into consideration the river flow to ensure continuous flow of water. The plan has to consider the extreme weather events, since the predictions for the next 10 years indicate that the city will be vulnerable if no action has been taken to mitigate the impacts of typhoon and drought events.

Planners need to be aware of Nature Based Solutions as viable options to improve the master plan by involving other stakeholders and decision-makers in order to avoid risks and improve planning. Finally, planning has to be an integrated process that is inclusive to the whole basin; including aquifers and wetlands not only surface water sources.

Summary and key highlights – Session 1

Basin management is complex due to the complex nature of the ecosystem. The large number of stakeholders across a basin adds to this complexity and makes basin management more challenging. Therefore, collaboration across stakeholders is essential to address this complexity and to facilitate the transition to Basin-Connected Cities.

It is also important to recognize transformation to basin-connected cities is not an emergency action; it needs a long term and phased approach with proper engagement of all stakeholders, where communication is important to set up plans, strategies and inclusive community engagement. Consequently, basin-connected cities need **strong Communities, strong Partners and Passionate Influencers** in order to have effective capacity building that enables communities to be self-organised and take decisions. In addition, sharing data and capacity building can be a means to bridge diverse approaches across a basin; this will be supported by a “champion utility” within the basin to drive agenda for the watershed among various stakeholders.

The co-benefits from using Nature Based Solutions (NBS) can be quantified through cost-benefit assessments, which include the costs and benefits for each stakeholder. Cost-effectiveness is also a means to measure success of Nature Based Solutions and leads to increased acceptance and willingness to invest in those solutions, accordingly the demand for Nature Based Solutions will increase

Although economics and measuring success can drive Nature based Solutions, decision makers are responsible to encourage community engagement and ownership of NBS to ensure their sustainability. Consequently, partnerships and clear legal and regulatory frameworks are essential to bring stakeholders together, where each one of them understands his/her role and responsibility, it also helps to identify costs of implementing NBS, benefits and willingness to adopt NBSs among various stakeholders..

Regulators and planners have the lead role in moving to a total cost approach that actively incentivizes utilities to adopt green solutions, enables co-financing, cross-subsidies and other approaches that allow for strategies of services beyond water e.g. considering circular economy approach with resource recovery to generate income and reduce costs. There also needs to be scope to allow stakeholders to go beyond their prescribed mandate through flexible policy and regulatory frameworks.

It is essential to keep in mind that basins are more than just surface water; basins are also groundwater, reused water, storm water and complex ecosystem that support water cycle. The case of Suez has shown that cities have started to be more connected with their aquifer, where

Suez was involved in aquifer recharge in Perth, Australia in order for water corporations to reach “rainfall independence”. This transition breaks the old practice of operating in silos and start evidence-based discourse that addresses all stakeholders, as well as the availability of dedicated funding, political backing and community engagement.

Session 2 – Innovative practices: Tools for action

The second session focused on the tools for actions that enable basin-connected cities including governance strategies, incentives and building capacity. The session started with a keynote by **Dr. Chien-Hsin Lai, Water Resources Agency, Chinese Taipei**. This was followed by a panel discussion on innovative practices with experience from Adrian Sym, Alliance for Water Stewardship, UK; Eric Tardieu, International Network of Basin Organisations, France; Jean Spencer, Anglian Water, UK; David Hetherington, Arup, UK; Matsumoto Shigeyuki, JICA, Japan. After the panel, there were a series of roundtable discussions moderated by international organisations, development banks, government, research institutes and NGOs.

Chairperson and facilitator: Will Stringfellow, Professor and Director of the Ecological Engineering Research Program at the School of Engineering & Computer Science at the University of the Pacific.

Session 2 – Keynote presentation: Resilient city, Circular Taiwan

Chien-Hsin Lai, Director-General of Water Resources Agency (WRA), Ministry of Economic Affairs (MOEA), Chinese Taipei

See presentation [here](#).

According to the 2018 global risk report from the World Economic Forum, extreme climates have the highest risk among all impacts. Therefore, the impact and uncertainty of climate change are the biggest challenges for national and urban development. At present, it is a priority to enhance water resource management and flood control, since about 69% of Taiwan's population is concentrated in urban areas.

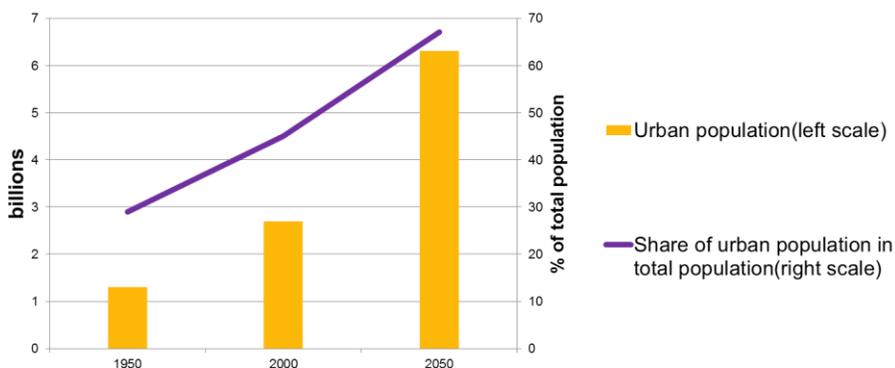


Figure 4 Global urban population growth (1950-250)

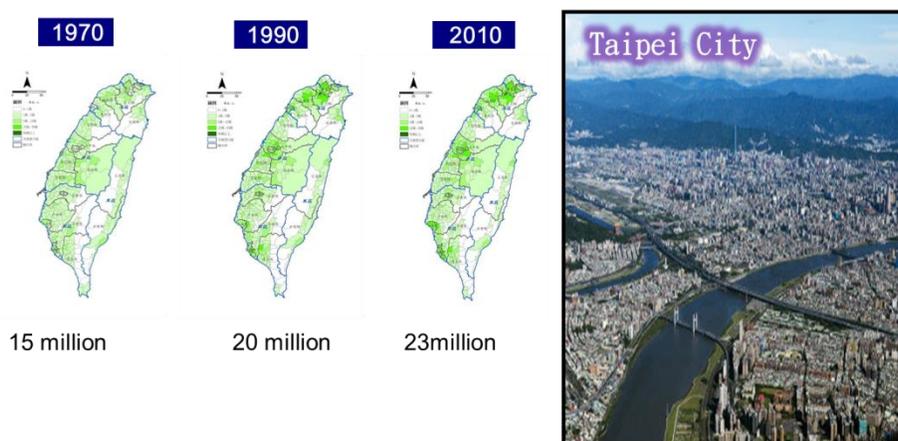


Figure 5 Taiwan has the same trend - Increase on water demand and discharge could exceed urban capacity

Since 2011, under the effect of climate change, Taiwan has faced grim challenges every year: drought resistance in the first six months and flood prevention in the rest. Therefore, Taiwan has accumulated lots of experience in water resources management and flood control.

Water resources provide water for agriculture, household and industry. In order to stabilize water supply, four strategies are adopted, including developing the multiple water resources, saving water, water allocation and preparing backup system.

To mitigate the flood disaster, several strategies have been implemented, such as three-dimensional flood control, a sponge city approach and flood disaster prevention. A latest policy of runoff distribution and outflow control has been completed, so that all land users in the watershed could work together to absorb flood waters and mitigate the risk.

In order to improve the decision-making efficiency, big data analysis is used to estimate the disaster sites occurring frequently and water level monitoring is set up in advance combining weather information to manage urban flooding.

Introducing the concept of circular economy, water resources management includes the goals of co-owning, co-sharing, and co-benefit.

The central and local governments work together as partners to live in harmony with water.



Figure 6 smart water management - Connecting cities to Basins

Lessons learned

In respect of the overall environment, society and economy, we will rebuild a more sustainable and resilient city.

Key messages

1. Ensuring a stable water supply is essential for continued growth and development.
2. All land users in the watershed could work together to absorb flood waters and mitigate the risk.
3. Need for partnerships of cooperative management between the central and local governments.

Session 2 – Panel discussion

The AWS Standard: engaging water users for sustainable cities - Adrian Sym, CEO of Alliance for Water Stewardship, UK

Discussion Question - *How can we motivate and enable major urban water users to be active water stewards in their catchment?*

An increasing number of cities around the world are looking down the barrel of looming water crises. The upside is that most cities recognise that water is a bigger problem than any one of them could solve, that collaboration is a must, and that we need to collectively discover and then forge the practical framework of actions to address a shared challenge.

AWS water stewardship, with the AWS Standard at its heart, is based on a simple premise: that enabling organizations to make credible claims about improving their water use will help to build the trust and collaboration needed to ensure the sustainability of our most precious resource. It

understands that water is best managed by those who use through transparent multi-stakeholder processes. The AWS Standard offers a credible, globally-applicable framework to implement water stewardship, support public policy and recognise leadership through independent validation.

AWS water stewardship offers three key opportunities for progressive cities:

1. The AWS Standard provides a credible, neutral platform to engage major water users in addressing complex challenges, in a way that is connected to the broader catchment
2. Cities can use certification to the AWS Standard to provide incentives for major urban water users to improve water use and work collaboratively to reduce regulatory burdens; water related risks and to increase financial incentives.
3. Cities can align water management systems within the city to the requirements of the AWS Standard, thereby setting a leadership example of best practice (linked to 1 and 2).

The challenge for cities is two-fold:

1. Cities need to make the business case for water stewardship, not just internally but also to rate payers and community stakeholders, and;
2. Cities have the added responsibility of meeting the "public trust" and cannot always act simply in terms of short-term, narrowly defined financial preference.

Basin scale water governance and cities - Eric Tardieu, General Director, International Network of Basin Organisations (INBO), France

Discussion question: *How can basin organizations motivate and enable urban stakeholders to be active water stewards in their catchment?*

Wise Water Resources management necessitates an integrated approach, especially under the increasing pressure of climate change, urbanization or population growth. Interactions and dialogue are key between different sectors and different levels of water management to achieve such integration. Cities and urban water utilities are critical water users that impact and are impacted by water resources management beyond the sole urban perimeter.

Basins are the natural scale for an integrated and sustainable approach of water resources and uses, and in many regions basin organizations provide an institutional framework for shared governance, ideally involving all types of water users, developing activities and tools for monitoring, planning and managing water resources at the basin scale, regarding either water quality issues, water resources availability and allocation policies, or prevention and management of extreme events. These governance tools can benefit from an active participation and commitment of urban stakeholders. On their side, cities need to be included in planning documents and in management decisions. Shared knowledge tools and water information systems need to be developed, connecting urban and basin scales, in order to monitor the key water issues such as water scarcity, water pollution and climate change impacts on water resources.

INBO is a worldwide network of basin organizations, promoting the integrated approach of water resources management at the basin scale, through formalized institutional frameworks and the large association of various water stakeholders.

Lessons learned

Water Information Systems are efficient tools to connect cities and basins to plan, monitor and manage water resources in more integrated and participatory manner.

Key messages

Water utilities have to get better involved in water governance at basin scale.

Surface water management in the East of England - Jean Spencer, Executive Director, Strategic Growth and Resilience, Anglian Water, UK

See presentation [here](#).

Discussion question: *What elements needed to be in place to establish a long term sustainable approach to surface water management?*

Managing surface water places stress on our existing wastewater assets, which can result in flooding, pollution of the environment, and an increased carbon footprint associated with pumping and treatment. However, successful surface water management can provide headroom in our network to accommodate growth, whilst mitigating the risks associated with climate change and urban creep.



In Newmarket, Suffolk, we have implemented our first long term Programme for Surface Water Management. Delivering a long term sustainable approach and aligned to our customer facing Make Rain Happy campaign, this strategy will involve our customers, partners and stakeholders to help us effectively manage surface water across the region.

As part of this Programme, we have set ourselves a number of very ambitious targets which will help us to become more resilient to a changing world and meet our business goals of zero flooding incidents, zero pollutions, 80 litres per person per day, 100% satisfied customers and becoming carbon neutral by 2050.

By 2045, we will endeavour to reduce unwanted flows to water recycling centres and pumping stations by 100%, where cost effective and appropriate to do so, and significantly enhance the communities we work with by delivering substantial environmental benefits. We will achieve this by collaborating with our partners and customers to plant trees, disconnect downpipes at residential and commercial properties, deliver rain gardens, swales and wetlands in public open space, educate half a million school children and make funding available to communities to undertake their own retrofit work.

It is the first time to implement such a programme on a large scale, but with the backing of our customers and partners we believe that we can make surface water management a significant part of our future urban landscapes.

Restoring River Basin Processes for Urban and Rural Resilience - David Hetherington, Associate / Global Water Research Manager, Arup, UK

Discussion question - *What considerations are most important when selecting physical interventions to restore rivers systems? And how to overcome implementation obstacles? See presentation [here](#).*

Under natural conditions, river basins are in a state of dynamic balance and harmony and have optimized resilience and sustainability. However, world over, river basins have been artificially modified in numerous ways in order to allow for various types of land use and development. These modifications have impacted on natural processes, which have resulted in heightened degrees of flood and drought risk (due to reduced water storage and faster run off) and numerous other negative impacts that have reduced the value of the ecosystem services that healthy river basins can provide.

Cities and the people that live in them can be particularly vulnerable to the negative effects of artificial river basin processes, and the future changes to these processes that will result from climate change. We explain in this abstract how river basins offer opportunities to restore and improve hydrological, geomorphological, ecological and social processes to the benefit of cities. These opportunities are increasingly important in light of the combination of increasing global population, urbanisation and potential climate changed impacts.

Lessons learned

Cities and their populations can be more resilient to future pressures by using many approaches to restoring and improving river basin processes.

Physical interventions in river basins that move systems towards a more natural / healthy process state are crucial tools in the effort to counteract the myriad of climate change impacts that will affect cities and the wider landscape.

Key messages

In general, we can't completely restore and/or re-wild river basins back to a natural and sustainable state. However, with intelligent design we can implement river basin interventions that replicate or mimic natural processes and improve overall sustainability.

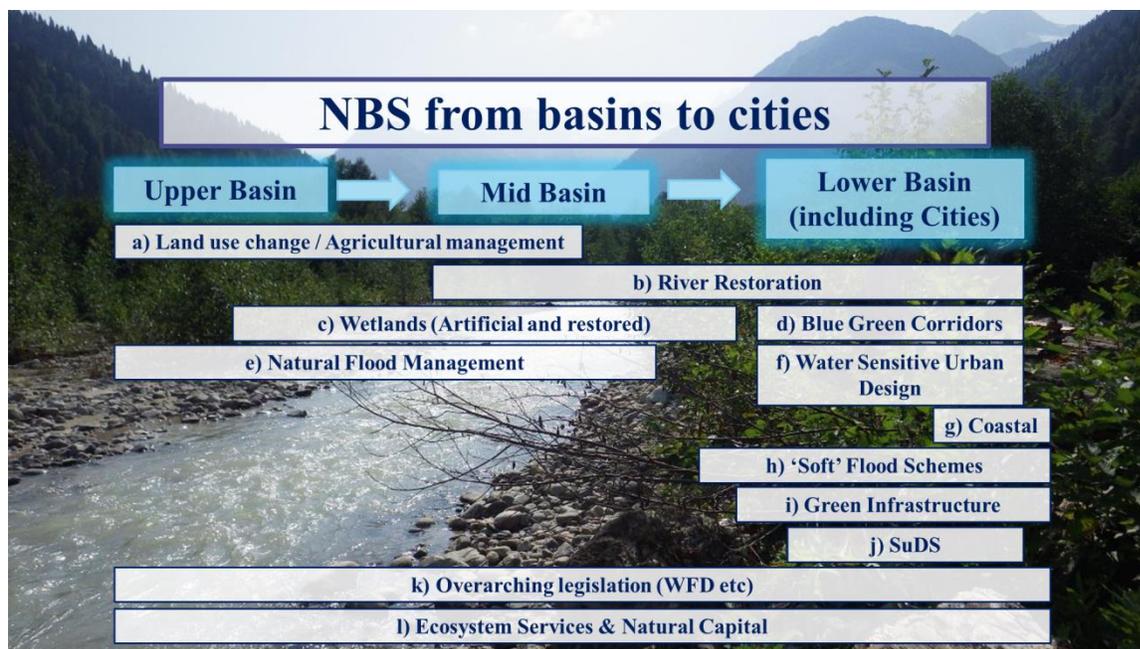


Figure 7 Nature Based Solutions - from Basins to Cities. ARUP

Knowledge sharing and co-creation to stop land subsidence in Jakarta - Matsumoto Shigeyuki, Director of Water Resources Group and Deputy Director General of Global Environment Department, JICA, Japan

See presentation [here](#).

Discussion question - How are you measuring/evaluating the impact of knowledge sharing and stakeholder engagement in cities for improved basin-wide water management?

The Japan International Cooperation Agency (JICA) has been extending its support to overcome the serious land subsidence issue in Jakarta. The issue is related to various water-related problems, such as groundwater management, alternative water supply to replace groundwater use, disaster risk reduction, and storm water management, and should be solved from the perspective of sound basin-wide water management.

The fastest-sinking city in the world : Jakarta

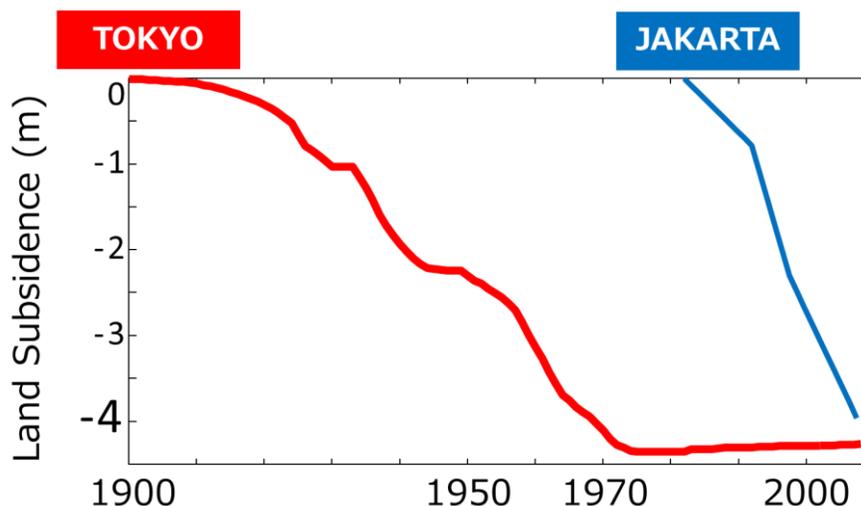


Figure 8 the accumulated land subsidence in Tokyo and Jakarta

One of the critical challenges is to set up an appropriate coordination mechanism involving important stakeholders and to make it work properly. JICA is trying to extract transferrable experiences and knowledge from the cases of Tokyo and Bangkok, which have successfully overcome the land subsidence issues, and apply them to Jakarta.

Lessons learned

The basin-wide water management requires engagement of broad stakeholders, including both the central government and local governments, and the leadership of the top management. Motivating them to take coherent actions is critical and can be catalysed by the learning of successful cases in other cities. Experiences and knowledge in other cities need to be transformed and adjusted to match the local contexts of the target cities, and this process can be effective through knowledge sharing and co-creation process by the active participation of both the antecessor cities and the target cities.

In order to accelerate countermeasures against complicated basin-wide water issues, following steps are effective; (a) awareness-raising regarding pressing concrete issues and their consequences, (b) involvement of top management (ministers, governors, politicians, academic, etc.), (c) establishment of multi-stakeholder coordination mechanism, (d) setup of workable and action-oriented administrative structure, and (e) formulation of feasible action plans by the interested parties with the sense of ownership.

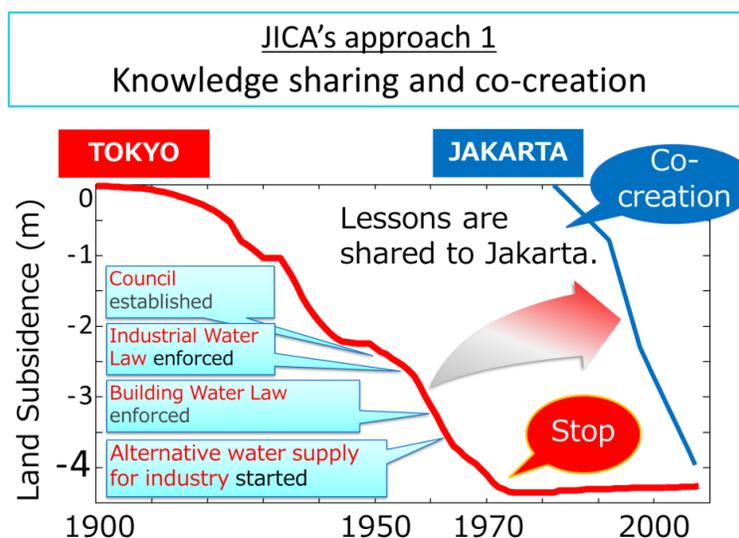


Figure 9 summary of JICA's approach in four points to tackle the land subsidence problem in Jakarta

Session 2 – Roundtable discussion

The roundtable discussions were organised to provide a platform for discussing a range of topics related to the main theme of the second session, where each roundtable has a moderator who presented a case study for 5 minutes and then led a discussion using the guiding question provided.

FINANCING: Innovative financing for cities and basins

Moderators – Hannah Leckie, Policy Analyst, Water Team, OECD; Aparna Sridhar, Policy Advisor, TNC, United States

Cities are major contributors to national economies and play a key role as nodes in global markets. But cities can only develop sustainably when they provide reliable water supply and sanitation services to city dwellers, and manage risks of too much, too little and too polluted water. In OECD countries, cities have achieved high levels of protection against droughts, floods and water pollution, and a vast majority of city dwellers enjoy reliable water services. This remarkable performance derives from distinctive combinations of infrastructures, business models and institutional arrangements. However, whether and how such combinations are fit for future challenges is unclear.

Cities are facing increasingly challenging environments: increased urbanisation; increased competition for water resources; increased financial pressure and budget constraints; increased exposure to, and likelihood, of water risks associated with economic growth and climate change; and higher public expectations with respect to quality of water services, level of water security and ecosystem health.

The financial conundrum in OECD countries is changing rapidly, with rising investment needs to renew ageing infrastructures, declining water demand in city centres, and competition to access public finance. Tariff structures and business models need adjusting accordingly.

Lessons learned

Robust financing strategies for urban water management combine four elements:

1. Maximise the value of existing water security investments. Investment plans can be optimised by minimising operating costs and investment needs through targeted maintenance, efficiency gains (e.g. from amalgamating water services at the right scale), demand management measures (e.g. water pricing and other financial incentives), using low-cost water resources that are fit for purpose (e.g. water re-use and recycling, grey water for gardens), and engagement with stakeholders. Such measures can reduce water-related risks and investment needs.
2. Select investment pathways that reduce water risks at lowest cost over time. This requires performing cost-benefit analysis on sequences (or portfolios) of projects and carefully considering how pursuing a specific project may foreclose future options. Investing in water security for sustainable growth requires not only investments in infrastructure, but also in institutions and information systems in order to maximise the benefits to society. These investments must be well-planned, fit in with broader development agendas, benefit local communities and the environment, and be flexible enough to adapt to changing circumstances.
3. Ensure synergies and complementarities with investments in other sectors. A better alignment of policies and investments across urban development, food and energy sectors will enhance water security.
4. Scale-up financing through risk-return allocation schemes. Governments can help to attract new investors by enabling public and private actors to earn returns commensurate to the risks they take. Tariff structures that contribute to effective water resource management (particularly water conservation) and the financial sustainability of water services are necessary to recover the capital, operation and maintenance and renewal costs of infrastructure. Three interrelated questions deserve renewed attention: How to address the implications of declining water demand? How to address affordability issues? And how to allocate costs in a fair way across users?

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OECD-WWC-Netherlands Roundtable on Financing Water:

<http://www.oecd.org/water/roundtable-on-financing-water.htm>

Summary of Roundtable discussion

Discussion Question – *How to address the implications of declining water demand? How to address affordability issues? And how to allocate costs in a fair way across users?*

Part of the financing scheme in many countries is through subsidies. The question is how do governments use subsidies as needed? And what are the other financing options that could be used?

A stable regulatory regime for using tariff/ water charges to pay for operational expenses (OPEX) is needed for a sustainable water sector (i.e. financially stable water sector) that is attractive for investments e.g. from the private sector. A number of financing schemes/alternatives could be used to achieve this financial stability. Examples of these schemes are: Match funding through partnerships; Multi-sector partnerships; and climate adaptation funding; PPPs; and voluntary financing schemes.

Collaboration for financing is an entry point and key factor for any success story. Such collaboration could be achieved through platforms and partnerships (Multi-stakeholders partnerships) which can catalyse new funding sources.

INDUSTRY: Industry's role in sustainable water security

Moderator - Ai Kishioka, Carbon Disclosure Project, Japan

Companies are important stakeholders for realizing job creation and material wealth in the development of local communities, at the same time they have serious responsibility in terms of climate change and water withdrawals from and discharges to the local environment. In 2017, CDP asked 4,653 of the largest global companies to provide data about their efforts to manage and govern freshwater resources. In total, 2,025 companies responded with disclosed water withdrawals of approximately 5.6 billion mega litres, which is more than the total volume of Lake Michigan. Water management is a local and regional issue unlike GHG emissions. Namely, a ton of carbon dioxide will have the same impact whether emitted in Tokyo or Dubai, and a cubic meter of water used in Tokyo has different consequences from a cubic meter used in Dubai. In 2017, 2,025 of the world's largest companies and 360 cities voluntarily reported over 7,300 water related risks to CDP, representing shared water challenges within 149 of the world's river basins across 102 countries. It is also worth flagging that climate change has recently become an inseparable task when talking about water management. According to Japanese companies responding to CDP questionnaire, 78% of them identified changes in water-related physical climate parameters as inherent climate change risks that have the potential to generate substantive financial impact.

Currently many large companies are collaborating with other stakeholders and municipalities to preserve the local water environment. See additional information [here](#).

Key messages

Companies are important stakeholder for realizing sustainable water security in local environment.

Summary of Roundtable discussion

Discussion Question - What is the role of industry in realizing sustainable water security from catchment to city?

Stakeholder engagement is important to enable better understanding of the water resource and the impact of industry on the environment, and to achieve inclusiveness and engagement at large scale. This knowledge needs to be transferred and translated into simple language to reach out to the broader community and to facilitate actions and investment in water supply infrastructure and public awareness of water conservation resulting in an integrated system of water sustainability.

Leadership is integral to knowledge, engagement and community awareness to achieve water management efficiency through building trust between stakeholders, and to encourage capable people to take the initiative, to make connection, and recognizing the different roles in the city.

LAND & WATER: Land and water management for water security

Moderator - James Nickum, International Water Resources Association, Japan

As a global, knowledge based forum for bridging disciplines and geographies open to all concerned with the sustainable use of the world's water resources, the International Water Resources Association (IWRA) has a particular interest in transboundary issues such as the relationship between megacities and the basins that provide their water and receive their discharges.

The connections between cities and basins commonly cross administrative, professional and disciplinary boundaries. Without even considering virtual water, with few exceptions large cities rarely source the bulk of their water within their municipal boundaries. Sometimes "citysheds" extend outside the basin of the city itself, and occasionally into a number of basins, including inter-basin transfers. It is not always possible for cities to exclude polluting activities, such as industrial agriculture or recreational facilities such as golf courses, within extensive and once relatively pristine source areas. Similarly, it is difficult to manage the extent and cumulative impact of activities within watersheds as this process is complex. Extensive multi-stakeholder consultation is difficult but essential to reach workable compromises. Further, economic instruments such as payments for ecological service might be required and where applicable, policy instruments such as penalties, quotas, process guidelines or emission limits.

The transboundary, inter-sectoral nature of urban water supply, disposal and storm management brings to the fore issues of governance, legal frameworks, relative bargaining power, and property rights. New technologies such as reverse osmosis and smart water (real time monitoring etc.) approaches, while important for improved water security, cannot completely provide resilience in the face of extreme events or decouple cities from their hinterlands. Nontechnical, often political approaches remain necessary; but most water agencies are ill equipped to negotiate these waters. Broad, multi-sectoral approaches are necessary in both science and policy, and in connecting the two. For example, even within cities, and still more in their watersheds, water management cannot be divorced from land

management, including engaging private owners. While there is a wealth of experience, we are still in the early part of a steep learning curve. More information is available [here](#).

Summary of Roundtable discussion

Discussion Question - *How can cities play a role in both land and water management in their catchments?*

Basin scale management involves negotiations with wide range of stakeholders which require skills that water engineers do not have. This is reflected in the example of the city of Paris where negotiation with farmers for low impact farming had partial success and it was not an 'engineering' task.

Besides the negotiations skills, accountability is paramount which is sometimes lacking in land management. Accountability can be achieved when all stakeholders have the same understanding of the issue, under clear science-based regulations and policies. On the other hand, science needs to be communicated in a simple way to ensure that everyone understands it. Finally, all these elements are affected by the political environment which has direct impact on legal and regulatory frameworks e.g. UK government may loosen water regulations because it is moving towards more capitalist approach.

GROUNDWATER: Connecting Watersheds to Groundwater Flow-Systems in Urban Catchments

Moderator - Kevin Parks, Alberta Energy Regulator | Alberta Geological Survey, Canada

Watersheds are defined by 2D aspects of surface topography and drainage. Groundwater flow-systems are defined by 3D geological basin geometry, geology, and climate. Watersheds react to surface weather at time scales of hours to months; groundwater flow-systems react on scales of years to millions of years. This means that groundwater flow-systems can act to buffer watershed dynamics and make their hosted cities more resilient to hydrological fluctuations.

The opposite though is true; mismanaging groundwater flow-systems can cause impairments of watersheds that are essentially irreversible. To take advantage of groundwater flow-systems by cities, there needs to be good hydrological and hydrogeological understanding of how the surface and subsurface areas are connected and at what time scales they respond to stress and management. Once this is known, we can make choices on land use and water distributions that support maintenance of a helpful groundwater regime under our cities and watersheds, and we can use knowledge of groundwater flow-systems and aquifers to build resilience in urban water systems and watershed ecosystem-services. A hypothetical example of how aquifers can be linked to a regional water system supported by a centralized water-treatment and distribution facility in Alberta, Canada, shows how this concept can work to help watershed stewardship. More information can be found [here](#).

Lessons learned

Co-planning and co-governance of linked natural and built water infrastructure is best supported with a good scientific understanding of the full 3D space occupied by linked surface and

groundwater systems. As well, you need a dynamic view of how the components and the system respond to stress and decisions by water managers. The information requirements to start this process are fairly minimal, so the barrier to entry to this approach is fairly low.

Summary of Roundtable discussion

Discussion Question - *How are urban areas linking both surface and groundwater management, and what are some of the threats and opportunities?*

Groundwater is a 3rd dimension to connect cities with basins as well as to improve water services resilience and sustainability; this understanding needs more work on the decision-makers level and community level. Therefore, there is room for raising awareness and communication.

Raising awareness is usually seen as a task of targeting community, citizens, end users...etc. However, and particularly about groundwater, there is a need to start with decision makers before citizens or end users.

WASTEWATER/FRESHWATER: Integration of water and sanitation systems in freshwater ecosystems

Moderator - Lluís Corominas, Research scientist, ICRA, Spain

We need better knowledge on how urban wastewater systems and freshwater ecosystems perform together: Urban wastewater systems (UWWS) have the functions of collecting, transport (sewer systems), storage (storm water tanks) and treatment (wastewater treatment plants, WWTP) of urban wastewater and stormwater before discharging to the receiving water bodies (river, lake, sea). UWWS not only alters the water quantity and quality of the receiving water bodies, but also significantly affects fluvial ecosystem structure and function and therefore proper management strategies are needed. In some cases, effluents from WWTP still account for more than 50% of stream and river nitrogen and phosphorus loads regardless of the climatic region where streams are located. Knowledge on the spatial and temporal transformation of organic matter and nutrients in WWTP and freshwater ecosystems is rather fragmented. In fact, numerous studies have assessed attenuation (net balance between removal and release from and to the water column) of nutrients in either WWTPs or freshwater ecosystems. There is need to assess attenuation of organic matter, nutrients (and micro contaminants) including both systems within the studied system boundaries and using the same methodological approach.

We need better integration of policies: In the last decade the political awareness of river water quality issues has grown substantially over the world and legislation is accordingly adapting. In the European Union (EU), two different directives regulate separately the characteristics of the discharged water and the chemical status of the receiving freshwater ecosystem. On the one hand, the characteristics of the urban effluents are regulated by the EU Directive 91/271/EEC, which defines limits on different elements set in the form of both static emission limits and minimum percentage load reductions. On the other hand, the characteristics

of the receiving freshwater ecosystems are described in the EU Water Framework Directive (2000/60/EEC), which sets minimum 'good' chemical and ecological status in water bodies that should be achieved by 2015, and aims for an ecosystem-based management. There is a gap in these two EU environmental policies leading to non-integrated management, which may result on adverse environmental and economic consequences. We believe that these policies should be updated and tuned to account for an integrated perspective, allowing a more efficient and sustainable management of wastewater treatment plants, maximizing the ecological, economic and social benefits of the system as a whole.

Summary of Roundtable discussion

Discussion Question - *What is needed to effectively integrate urban wastewater systems with freshwater ecosystems?*

Regulation and legislation in many developing countries is a huge issue and a high need. Technology and knowledge transfer could be part of the solution. However, a political commitment is needed in order to make a difference.

What is most needed to achieve integrated urban wastewater systems with freshwater ecosystems is a dialogue including all stakeholders at the different levels e.g. decision-makers, utilities. Industries, researchers, regulators and end users also learning from other experiences where lack of dialogue has created serious issues in Europe, India and other regions. Government has to play an important role in managing different interests and deal with lobbies which might arise within these dialogues, especially particularly lobbies of industrial sectors which might have strong influence. It is important for the different stakeholders to adopt science-based evidence generated from models and research outputs.

GROUNDWATER: Conjunctive groundwater protection

Moderator - Michael Eichholz, International Cooperation: Policy Advice on Groundwater. BGR (Federal Institute for Geosciences and Natural Resources), Germany

Around the world, groundwater is a main source for urban water supply. Groundwater protection is crucial to maintain water resources quality and quantity for the future. However, groundwater is a shared resource between different actors in cities and basins, which makes groundwater management a more difficult task. While low groundwater levels affect groundwater-based irrigation, forestry and nature conservation, high groundwater levels may provoke damages to buildings and costs to private and public landowners.

The Rhein-Main metropolitan area around Frankfurt in Germany is one example of diverse actors' interests – sometimes conflicting interests— in groundwater management. The region is densely populated and home of intensive agriculture and forest ecosystems. Actors in this region debated about what the best water management approach. In the meantime, the decline of forests in the wellfield areas of the public water supply drew attention to the problematic situation. A round table of involved stakeholders was installed to reach consensus about future groundwater management.

Lessons learned

Conflicting interests of stakeholders are complex and sometimes difficult to resolve. However, stakeholder participation and involvement in basin water management helps to increase mutual understanding and create broader acceptance for management decisions.

Key messages

Water problems are governance problems: for sustainable and innovative solutions, the scope should go beyond traditional water sector thinking. An open and transparent approach helps to bring stakeholders together.

Summary of Roundtable discussion

***Discussion Question** - How to manage stakeholders' different interests, values and understanding in order to improve groundwater management and governance?*

Case study from South of Germany (Hessien Ried) where Groundwater (GW) aquifer supplies water to the city of Frankfurt and surrounding area;

GW management involves several actors such as Agriculture, Public water supply, Frankfurt Forest industry (to stabilise the forest for timber and recreation), Environmental groups, and inhabitants who want to ensure a regulated water level to avoid damage to property.

GW levels declined considerably when water utilities pumped water from the area in order to supply its growing population with water for domestic use and irrigation. This resulted in forests drying up, consequently generating a debate about the future of the forest. A quick solution was to stabilize the ground water table by recharging the aquifer with river water and using treated water in irrigation. The groundwater table level went up but caused damage to crops, and infrastructure particularly for houses and basements. The result of this quick solution led to increased conflict in interests between stakeholders.

A feasibility study was conducted to assess how much water is needed to keep the forest healthy without damaging houses or crops. The study was heavily contested among the actors as they were not included in the process itself. Consequently, a round table has been established to find a solution with a new inclusive approach (state level and local municipal level, forestry, farmers, water supply, household owners, etc.).

Another example was discussed from Tanzania, where groundwater management is bringing people together. One town in Tanzania is dependent on groundwater supply for domestic use and agriculture. However, it is difficult to satisfy the needs of the various stakeholders all the time even by applying inclusive approaches such as initiating discussion among stakeholders to reach a solution. The options discussed ranged from removing the settlements, stop cultivation, removing non-indigenous trees, etc.

Another case in Kenya showed how weak regulations resulted in exploitation of the resource for own interests regardless of the sustainability of groundwater management. Inhabitants and big developments including hotels and commercial buildings, have drilled at a shallow depth of 80 – 100 meters, because the utility is not able to meet the demand for developers.

Aquifer / groundwater ownership is also a point of discussion where different countries have different laws. For example in Japan, civil law states that GW is the private property of the landowner however the owner cannot regulate extraction.

In Germany, GW cannot be possessed by an individual. A land owner owns land 20 meters down and the rest is for the municipality. Germany is decentralized so each state has its own policies.

DECISION SUPPORT TOOLS: Australian Water Tools for Integrating Urban and Basin Water Management

Moderator - Nicholas Schofield, Chief Executive Officer, Australian Water Partnership, Australia

Australia has managed major cities water and rural basin water separately. In rural areas, Australia has dramatically reformed its water management, resulting in a complex and highly sophisticated approach to allocating water to competing users (irrigators, industry, urban and environment), capping consumptive water use and pricing water through water trading within water markets. In cities, water management has focused on alternative water supply sources (e.g. desalination, wastewater treatment and re-use, and managed aquifer recharge) and demand management. These strategies have been successful in improving sustainable water management outcomes.

In line with the separated management of water in urban and rural areas, tools that underpin and enable day-to-day water management have likewise developed separately. However, with increasing competition for water, and at times the need to manage through extreme droughts, Australia's national hydrological modelling platform, eSource, is embarking on the integration of its urban water modelling platform (Music) and its basin modelling platform (eSource). This integration will for the first time enable water planners and managers to examine the interplay between urban and basin water management. For example, the impacts of water conservation measures undertaken in the city on future basin water supply infrastructure (e.g. pipes, dams) will readily be determined. The integrated tool suite will be released in late 2018. More information can be found [here](#).

Lessons learned

1. The mix and extent of water supply options for major water users is changing rapidly under climate change and population dynamics.

2. Tools that integrate urban and basin water management, and enable policy change and innovation, are increasingly important for water planners and day-to-day water managers.

Key messages

Australia has one of the most sophisticated water management systems globally and this is only possible with the use of sophisticated integrated water tools that meet the daily and longer-term requirements of water planners and managers.

References

www.waterpartnership.org.au

www.ewater.org.au

Summary of Roundtable discussion

Discussion Question - *What capacity and knowledge is needed to effectively apply tools such as modelling platforms?*

Integration of urban and basin catchment platforms improve decision making process. Modelling systems are used in Australia that combines a variety of formats to inform overall model voyage. Examples of these models are:

SOURCE: catchment equivalent model has been used in 90 countries and about 3500 users.

MUSIC: urban integrated water management platform has been used in 13 countries.

Models can be used at different scales to mitigate climate change impacts; in Cambodia every catchment has been modelled to forecast drought prediction for rice farmers to mitigate drought impact on crop yield. Therefore, decision makers can use such tools to ascertain decisions outcomes.

Data collection at basic level i.e. baseline assessment is a first step, and then there is a need for data integration and use of this data through modelling. Forecasting at the top of the model is augmented by real time (or near real time) capability to understand the dynamic of forecasting.

RIVER RESTORATION: A Paradigm Shift in Urban River Management in Iran: Tehran River Restoration

Moderator - Niloofar Sadeghi, Research Specialist, Regional Centre on Urban Water Management, Iran

The Ministry of Energy of Iran (former Minister of Water and Power) is in-charge of water and river management country-wide with a little room for municipalities to intervene in urban water/river management. However, in the case of Tehran city an official agreement has been signed in 2007 between Ministry of Energy, Tehran Municipality and Tehran City Council for trilateral cooperation on storm water management as well as urban river management and flood control at basin level. In fact, this agreement is the time in Iran that a city became an integral

part of basin management.

The Ministry of Energy of Iran and Tehran Municipality still have water management – related questions, including right to recycle wastewater in city area , water allocation at the basin level between different users and collecting sewage. However, the agreement is suggested to start with the common interest areas such as restoration and improvement of river valleys and Tehran streams. This practice leads to a better understanding of each party and effective contributions of Tehran Municipality towards creating sustainable natural landscapes in Tehran by shifting paradigm to urban river restoration. The Ministry of Energy also came to a better understating of Tehran Municipality needs and constrains.

Lessons learned

1. Adapting outdated water management legislations and institutional arrangements to the dynamic socio-economic environment of developing countries.
2. Advantages of the basin-connected approach in arid and semi-arid areas.

Key messages

What are the economic incentives of a basin-connected city?

Summary of Roundtable discussion

Discussion Question - *How can legislation and institutional arrangements more effectively respond to a dynamic socio-economic environment?*

In Australia the environment is formally represented by the Environmental Water Holder in negotiations throughout the Murray Darling Basin negotiations with different states. The representation of environment put a balance to the equation: to emphasise the interest of the basin itself (as a part of the environment) in negotiations, not only stakeholders' socio-economic interests. There is a need for a common vision across the basin in order to manage the different interests. Information and data sharing is a first step to bring all stakeholders together on the same page.

Outdated regulations in developing countries hinder restoration efforts by closing the door in front of innovation and flexible regulations that might bring value.

REGULATION: Connecting cities and their basins through regulation: actions and challenges

Moderator - Vanessa Fernanda Schmitt, Administrative and Institutional Director - Regulatory Agency of public services of the Middle Valley of Itajaí, Santa Catarina, Brazil

Regulators have a central role in connecting cities to their basins by developing guidelines for basin connected cities, considering building flexible regulatory frameworks that consider different aspects such as: water security, water quality and quantity, environment conservation and resilience to extreme weather events.

For this, regulators' responsibility is to develop source to consumer integrated regulatory frameworks that enable resources optimization and sustainable management. Regulators have to identify basin governance deficits and work on developing pathways that ensure investments in basin management; information sharing among stakeholders; green and grey infrastructure development.

Regulators are enablers of water resources conservation at basin level. This can be achieved through the regulators' role in providing guidelines and standards for water and waste water service providers to improve drinking water quality and treatment efficiency of discharged effluent.

Finally, it is clear that regulators must adopt a source to consumer approach in their agenda and develop legal and structured actions to achieve this approach, in addition to awareness and communication campaigns for end users and decision-makers, while ensuring participatory processes that include the various stakeholders.

Lessons learned

Regulators can be key players to promote that each stakeholder knows their role and work together, in a profitable discussion to contributing to guarantee the basin resources.

Regulators need to be able to draw equilibrate all the interests and even address that the legal way is applied.

Key messages

Basin-connected cities can help accelerate benefits of Integrated Water Resources Management.

Regulation provides a legal and sustainable frame to achieve cross-sectoral and institutional collaboration, and ensure an economic coherence of sectoral regulations.

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www.aqir.sc.gov.br

www.aqua.org.br

Summary of Roundtable discussion

Discussion Question - *How can regulation create incentives for achieve cross-sectional and institutional collaboration between cities and basins?*

Brazil have National and Regional sets of regulations concerned with water sources/catchment and water supply & sanitation. However, these two regulatory bodies are working in disharmony with weak communication channels and too many stakeholders to deal with. A starting point to mend this gap is education and awareness on existing national laws when setting/developing regional regulations that will create a space for different stakeholders to collaborate, stakeholder collaboration can be strengthened through platforms or other tools that fit the context.

Regulations need to be informed by the realities and needs on the ground such as including basin management costs on water tariffs. This means using the evidence base, otherwise it will fail.

ECO-COMPENSATION: Eco-Compensation Mechanism to Connect Basin and Cities for Water Resource Protection

Moderator - Yoshiaki Kobayash, Principal Water Resources Specialist, East Asia Department, Asian Development Bank, Japan

Eco-compensation is a package of different mechanisms, including monetary subsidies and project support, that governments use to compensate those who invest money or suffer economic losses to protect ecosystems (often landowners or resource managers in the upper watershed) by transferring resources from those who benefit from or damage them (such as consumers of potable water and industries or agriculture using water downstream). This session will discuss: how effective eco-compensation is for connection between basin and cities for water resource protection, and what are the challenges for promoting and eco-compensation mechanism? More information can be found [here](#).

Lessons learned

Eco-compensation is effective to connect basin and cities to protect water resources. However, there are several challenges promote and disseminate eco-compensation mechanism (e.g. systems to monitor restoration of degraded ecosystems; incentives for local governments to put a high priority to the effective implementation of eco-compensation such as policies and guidelines).

Key messages

Eco-compensation connects basin and cities for water resource protection.

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Summary of Roundtable discussion

Discussion Question - *What is needed for an effective eco-compensation scheme (e.g. monitoring, incentives)?*

Inter-city compensation between provinces upstream and downstream can be implemented through coordination, where incentive based payment mechanism can be developed. For example, downstream provinces and upstream provinces can compensate each other based on their practices i.e. upstream province pays to downstream province if the latter didn't improve its water management/basin management practice that impacts stakeholders downstream. However, there is a need for a coordinating body and regulatory framework to enable the eco-compensation scheme, and active participation of the private sector.

Summary and key highlights – Session 2

Session 2 discussed different tools to achieve basin-connected cities. Moderators discussed a variety of approaches including:

- Financing approaches
 - Innovative financing for cities and basins.
 - Eco-compensation mechanisms to connect basins and cities for water resource protection.
- Decision support tools and data
 - Modelling tools for integrating urban and basin water management;
- Integration of groundwater in basin-connected cities
 - conjunctive groundwater protection;
 - connecting watersheds to groundwater flow systems in urban catchments;
- Regulation
 - The role of regulations in connecting cities and basins;
 - Integration of water and sanitation systems in freshwater ecosystems;
- Stakeholder engagement and communication
 - industry's role in sustainable water security;
 - land and water management for water security;
 - river restoration mechanisms;

Participants agreed on key elements that create an 'enabling environment' for basin-connected cities. One of these elements is stakeholder involvement that ensures actual empowering of the people through:

- Information disclosure (transparency);
- Public participation in decision making systems and processes;

- Cross domain cooperation;
- Creating a resilient and harmonic environment between water and people.

Monitoring of water resources management is another key element for basin-connected cities transition, where lack of information and monitoring on the state of water resources, either surface water or groundwater aquifers, need to be addressed.

Sustainability is important to ensure a continuous Basin-City connection and healthy development. There it first steps in developing a long term plan should include:

- Understand the assets and manage uncertainty to build a resilient future.
- Build collaboration between stakeholders such as local authorities, environment, transport, etc.
- Promote innovative and green infrastructure – e.g. sustainable urban drainage systems.
- To promote innovative methods or campaigns to achieve behaviour change among communities (e.g. make rain happy, million tree, etc.).

Knowledge and experience sharing between countries was considered as effective tool to help the global community reach sustainability and better management of water resources, for example; knowledge sharing and co-creation to transfer Tokyo's experience to Jakarta in the land subsidence issues, for that there is a need for:

- Awareness raising of the top management.
- Establishing coordination mechanisms.
- Formulation of feasible and adaptive action plans.

Finally, participants found that one of the key challenge is outdated regulations and/or unnecessarily strict regulations particularly in developing countries that hinder restoration and basin development efforts. The solution is evidence based decision making tools that inform decision makers about water systems and who are the stakeholders and their needs. Evidence based decision making tools and/or platforms consider climate change and its impact, which adds more value to these tools (e.g. Platforms that provide near real time climate data).

Final conclusion

Some of the key challenges to achieve a basin-connected city include:

- Silos still prevent water managers from working together to have a common basin-connected cities approach.
- Funding can be limited, or at times inexistent, for investment in programs that can help achieve a basin-connected city
- Short-term returns overshadow long-term benefits.

To succeed in connecting cities with their basins, we must have an integrated and multi sector wide-view approach. For example, most catchment programs fail to include groundwater, but

aquifer recharge needs to be an essential component. We also cannot completely restore or re-wild basins, but we must aim for sustainability by mimicking natural processes.

Economics can be a factor driving sustainability for example, through the use of nature based solutions for basin-city water management engagement. The identification and value of co-benefits from using approaches such as nature based solutions (complementing grey infrastructure) need to be clearly articulated and communicated. This can be through whole society cost- benefit analysis, which can also be used as a basis for measuring success.

Another sustainability driver can be in the form of customer demand and acceptance, as well as community engagement which include highlighting roles and responsibilities is needed in implementation of solutions. This can also lead to increased acceptance and increased willingness to pay for example in improved upstream management to secure water quality. Regulators and planners need to have total cost approach such that they include ways that incentivize utilities and other key urban water users to move towards green solutions, enables co-financing and cross subsidies.

In addition to community engagement, partnerships are essential for a basin-connected city to bring stakeholders together. For example, urban water utilities have to get better involved in water governance at the basin scale. Furthermore, private sector cooperation is required for success, as the government's limited resources and capability may need to be supplemented to achieve a basin-connected city. At the same time, it also is helpful to have clear legal frameworks that can initiate bringing stakeholders together.

When looking at sustainable solutions for connecting cities and basins, there is often a mismatch between remediation and expected return. Innovation and transition towards basin-connected cities can happen slowly. Suez has employed a phased approach which started with research and piloting. Slow and prudent innovation is more deliberate than if it is a response to a crisis/emergency situation. Piloting helps to minimize and mitigate risks of innovative projects. Innovative financing is crucial in funding more programs at the basin scale. Even small capital can be impactful, too, if spent on the right projects.

Finally, it is also recognized that cities respond to different pressures, and these pressures must be leveraged to initiate or support the concepts highlighted in the Action Agenda for Basin-Connected Cities. In Tokyo, rivers flow rapidly because they are steep and short due to topography; raw water upstream has an immediate effect downstream, therefore requiring more thoughtfulness on the basin scale. Tokyo as well as Paris is also using the Olympics as an impetus for improved city-basin connections.