CASE STUDY

Integrating and localizing the eleventh Sustainable Development Goal on inclusive, safe, resilient and sustainable cities

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A. Integrated urban systems to support the delivery of the SDG 6 targets

The challenge facing the city of the future is to develop robust yet flexible systems that can respond to inevitable shocks—shocks presented by climate change, population growth, resource depletion, economic instability and natural and human disasters. There is a need to develop scientific, technological and social innovations necessary to build this new resilient city and to manage our transition to a more liveable and sustainable future.

Extensive research in energy supply, water management and transportation has begun to increase the efficiency of these individual infrastructural subsystems. Only recently, however, has research begun to develop an integrated analysis of urban services at the systems level to increase the efficiency of resource streams and improve the resiliency of overall urban systems.

Research on urban metabolism has used the analogy between cities and living systems for analysing, planning and implementing resilient and sustainable urban development[1]. Recent research has demonstrated that urban metabolism models are a powerful tool for combining and tracking different resource streams and comparing different scenarios[2]. The increased availability of data, coupled with recent developments in modelling and simulation, means that it is now feasible to conduct more detailed holistic analyses that allow us to consider the interactions and interdependencies between different flows of materials and to track the physical, spatial and temporal movement of all resource streams in cities, on a common analysis platform.

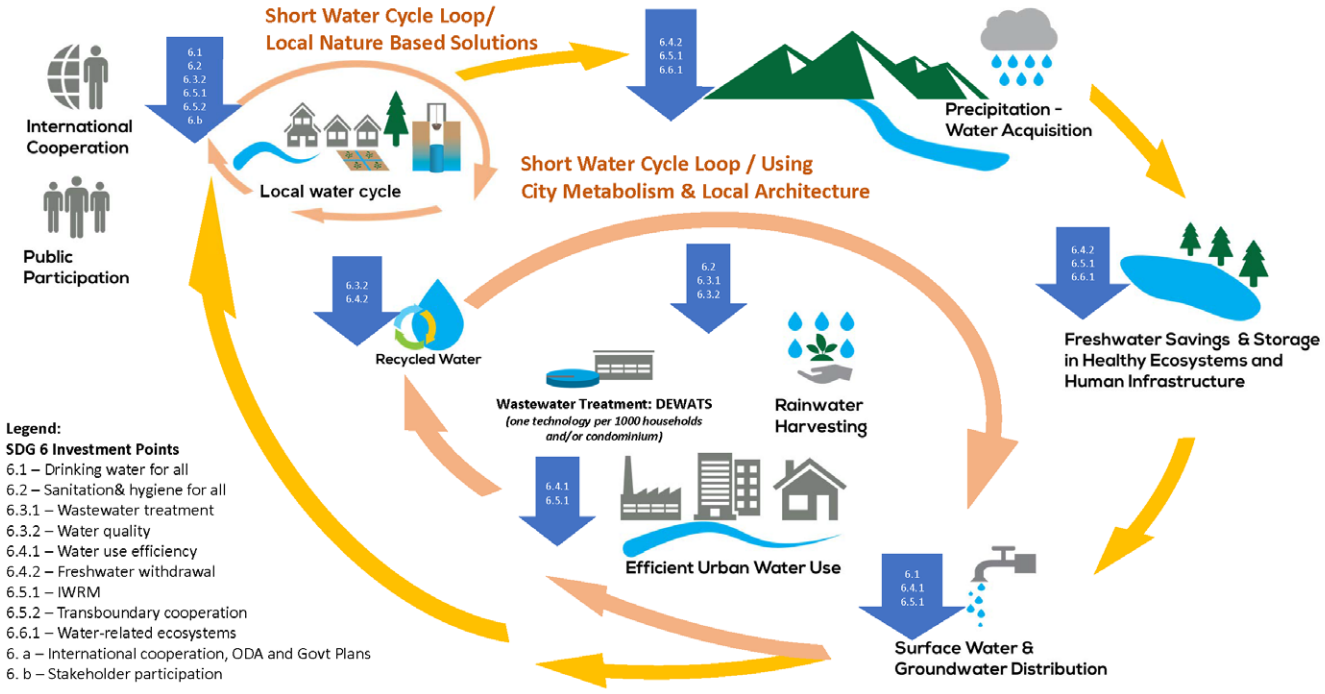
Research on collaborative virtual urban planning environments allows for the visualization of complex geospatial and demographic data sets that support strategic urban planning. There has been significant progress in the development and application of 3D-visualization tools, for instance, and these have enabled spatial planners, architects and engineers to optimize urban design and reconcile the impact of different spatial configurations on infrastructure systems and resource flows.

1 Golubiewski, 2012. Is there a Metabolism of an Urban Ecosystem? An Ecological Critique, pp. 751–764.

2 Ramaswami et al, 2012. A Social-Ecological-Infrastructural Systems Framework for Interdisciplinary Study of Sustainable City Systems.

The 2030 Agenda for Sustainable Development ushers in great opportunities to further develop and use existing innovations on urban systems analysis and to "make cities and human settlements inclusive, safe, resilient and sustainable" (SDG 11). For example, urban systems modelling and 3D visualization could be extensively developed and applied as a collaborative platform that facilitates fruitful debates and discussions among stakeholders. A 3D, collaborative virtual decision-support platform (incorporating the urban metabolism model) allows for the visualization of the relationships between urban forms and resource use. It also enables the creation of an interactive workspace that could be used by the public, experts, citizen stakeholders and policymakers to conduct foresight studies on "alternative futures" for scenario analysis. Such models would engage a broad range of stakeholders whose decisions influence the systems and resource flows and allow for planning the inclusive, safe, resilient and sustainable cities we want.

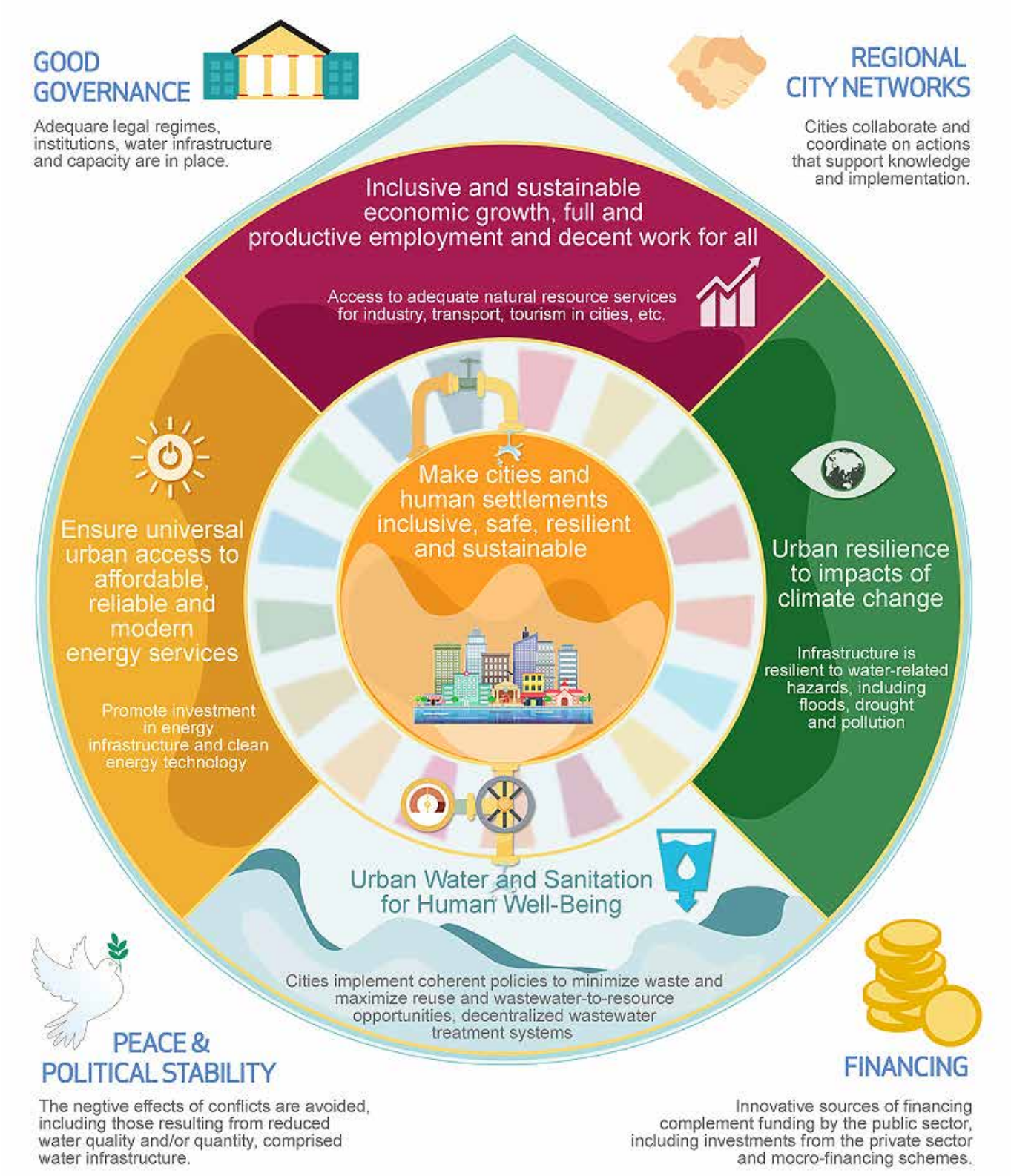
Figure 1. Urban systems model: Relationships diagram



B. Harnessing SDG interlinkages for inclusive, safe, resilient and sustainable urban development

To facilitate this transformation, SDG 11 which emphasizes making cities and human settlements inclusive, safe, resilient and sustainable should be the central priority—but in direct relationship with the related SDGs, as the following illustrates.

Figure 2. Making Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable by Localizing SDGs (ref. ESCAP, SUDS 2016)



C. Case studies and analysis based on the working group models

Reoccurring floods (SDG 13) led Nagoya, Japan, for example, to adopt the integrated water resources management approach (target 6.5) for a "water hazard-resilient city". Public participation and the promotion of multiple partnerships to carry out the plan fostered trust and better disaster prevention, built on better awareness of the renewable water cycle and its impacts on the health and well-being of the city (SDGs 3 and 8).

The Smart Water City Paju in the Republic of Korea adopted ICT techniques (SDG 7) that generate potable tap water, with a secure and safe water supply. This has removed apprehensions among the public, resulting in increased tap water drinking rates, jumping from 1 per cent to 24.5 per cent, with a high rate of customer satisfaction, at 88.2 per cent (Target 6.1) as measured in 2016.

The Public Utility Board of Singapore installed a deep-tunnel sewage treatment system to sustain the country's long-term needs. Both wastewater and treated-water is further purified at NEWater plants to meet 30 per cent of the country's water needs (Target 6.3). Thus, the innovative water and sanitation urban governance of Singapore, built on the inventive capacity of citizens, has improved health outcomes (SDG 3) and workforce productivity (SDG 8).

In Thailand, Bangkok's has levied a user-charge on wastewater, which is financing the process for treatment and being used to address other serious environmental issues. Bangkok promotes the education and participation (SDG 4 and Targets 6.a and 6.b) of local communities in wastewater treatment projects and as well as the reuse of treated wastewater in agriculture and industry.

Daego and Seoul in the Republic of Korea are applying eco-efficient infrastructure (SDG 9) and wastewater management (Target 6.3) for water-smart and resilient cities with integrated water resources management planning (Target 6.3) to mitigate climate change-related hazards, such as flood and drought (SDG 13).

D. Major challenges and how systems thinking helps address them

The drinking water and human well-being targets of SDG 6 focuses on ensuring access to safe, sufficient and affordable water to meet basic needs. This requires a foundation based on the urban population's human right to safe drinking water, sanitation and hygiene. Cities need to implement coherent policies to minimize waste and maximize reuse and wastewater-to-resource opportunities (such as through decentralized wastewater treatment systems[3]).

By targeting the achievement of SDG 7, a city could ensure universal access to affordable and modern energy services, with policy coherence to be achieved by promoting investments in energy infrastructure and clean energy technology. With cities responsible for 80 per cent of a nation's gross domestic product, the achievement of SDG 8 would herald inclusive and sustainable economic growth, full and productive employment and decent work for all. The access to adequate natural resource services for industry, transport and tourism in cities should be maintained with related integrated policy packages. SDG 13 works to strengthen urban resilience to impacts of climate change, but it requires policies that promote infrastructure that is resilient to water-related hazards, including flood, drought and pollution.

E. Stakeholder involvement, collaboration, cooperation and coordination between institutions

Integrated strategic approaches and enabling policy tools to facilitate a shift towards water-hazard resilient infrastructure and sustainable cities aim at achieving safe and adequate water supply and sanitation services, sound water-related ecosystems, a high level of water use efficiency as well as greater urban resilience to water-related disasters within the framework of integrated urban water management.

A sustainable urban metabolism is upheld intrinsically by systems thinking values, including in the urban water cycle, where alternate purposes for water resources are demonstrated by the integrated approaches applied in cities. The roles and responsibilities of the local and provincial governments to transform local needs and problems into sustainable strategies must be harmonized with the vision, goals and actions of the national government. And they require better awareness of water cycles and their services in all other sectors.

3 See https://sustdev.unescap.org/course/detail/4.

F. Recommendations

The adequate legal regimes, institutions, water infrastructure and relevant capacities could be maintained through good urban governance principles, in a condition of peace and political stability, whereby the negative effects of conflicts are avoided, including those resulting from reduced water quality and/or quantity and compromised water infrastructure. Local sustainable development should be promoted in several ways, such as sustainable city networks in which city administrators and managers collaborate and coordinate on actions that support achievement of all the SDGs.

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