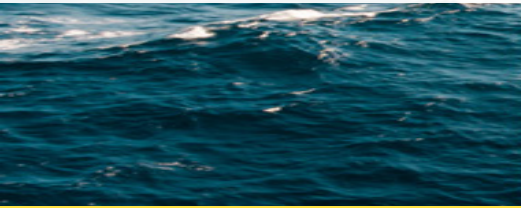


Innovating for Integration: Exploring possibilities for governing the Food-Water- Energy Nexus



Summary of the IFWEN Case Study Series

Updated in August 2021

Objective of the Project

Urban areas consume 70-75% of natural resources which significantly impacts resource scarcity and ecosystems beyond city boundaries. Urban areas are also highly susceptible to various environmental hazards due to their high concentrations of people, infrastructure and economic activity. In addition, their exposure to risk is being exacerbated by the climate crisis. Thus, productive resource use and resilience are becoming increasingly important, particularly in the Global South.

The Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) project examines capabilities and enabling factors which support implementation of food, water, and energy nexus approaches that use Green and Blue Infrastructure (GBI). The project aims to develop a framework and tools for decision makers to assess sustainable transitions in the food, water, and energy sectors, and potential opportunities for synergy between these resources. In addition, IFWEN aims to support building capabilities in cities for developing innovative solutions and managing GBI at the urban level. The project's findings are based on case studies in Antananarivo (Madagascar), Dodoma (Tanzania), Florianopolis (Brazil), Sao Jose dos Campos (Brazil), Gangtok (India), Nagpur (India), Taipei (Chinese Taipei,) Johannesburg (South Africa) and Lilongwe (Malawi).

These Cases are Contributing To:

Understanding Green Blue Infrastructure (GBI) and Food-Water-Energy Nexus (FWEN) interactions at local level

GBI refers to green spaces and water systems that provide tangible and intangible services in urban spaces, including parks, gardens, waterways, green walls, pathways and greenways. GBI can deliver various services relating to the different components of the FWEN. For example, it can provide food, water, fiber and fuel, support the ecosystem by aiding soil formation and nutrient cycling, regulate microclimate, mitigate floods and offer water purification. Further, GBI is vital for recreational and cultural interaction in nature as well as economic development through ecosystem-based services. Finally, cities need adequate GBI in order to support habitat and ensure effective functioning of the above ecosystem services. When managed well, GBI can facilitate efficient resource use and make communities more resilient.

Identifying capabilities and enabling factors required for innovative nexus approaches

Each case was examined to identify the capabilities and enabling factors that made it possible for GBI initiatives to take place. Those factors fell into the following categories: knowledge,



institutional, social, ecological, technological, and financial. Given the diverse forms of Nexus and GBI engagements exhibited in these initiatives, the varied perception of project success, and the typical presentation of Nexus as project based, reflecting upon the emergent capabilities and enabling factors gives us insight into how Nexus and GBI approaches can become more programmatic and sectorally integrated.

Lessons for future implementation

While Nexus is typically framed around resource optimization, these cases provide a demonstration of how Global South implementation of Nexus is less concerned with quantifications of resource trade-offs and more concerned with **delivery of social outcomes**. The motivations behind most of these initiatives include improved nutrition, climate resilience, public health, environmental responsibility, access to nature for public wellbeing and economic participation.

The case studies highlight the need for a deep understanding of local **context**, not only of the physical environment, but also of social norms, and legal and institutional frameworks.

The **interaction between global agendas and local priorities** provided a strong motivation in each case. Where projects did not show effective implementation or longevity of the project, stakeholders articulate key lessons which are supporting their reconceptualization and implementation approaches on future projects. Many of the projects sparked the development of new municipal policies and laws that have supported realization of a number of the projects and ensured their continuation.

To better understand local context and achieve policy and goal alignment, **multilevel and collaborative governance approaches** are needed. Where projects are stated to have achieved their objectives, even partially, this is attributed to effective alignment between policies, objectives and actions at different levels and across departments and stakeholders. Cooperation between actors at various levels and scales can also help secure funding and ensure that the interests of different actors are considered, and trade-offs and synergies between FWEN sectors are taken into consideration. The IFWEN project hopes to inspire future GBI projects to position themselves within existing legislation and create new policies to facilitate nexus approaches.

Participatory approaches and public-private partnerships are effective tools for understanding the local context and ensuring that goals and plans align with the needs of users. Significantly, it affirms a sense of community ownership of the project. Training users to use new technologies and approaches, and receiving feedback were essential in some projects. Although challenging, the IFWEN project encourages future GBI projects to involve all relevant stakeholders in the development and implementation stages.

Engaged local leadership can shape long-term strategies and relevant legislation for nexus approaches. Local governments have the power to cross organizational boundaries, facilitate network-based decision making, access and allocate resources from different sources, and shape private sector responsibilities. Further, local leadership serves a vital role in bridging global agendas and local implementation, as well as connecting citizens and the private sector. However, where local government faces difficulty crossing departmental or mandate boundaries, the support of an intermediary organization can prove valuable.

In terms of **financing**, it is important to make sure funding meets the needs of all project stages. Finances must extend to capacity building, monitoring and evaluation, and developing an action plan to maintain the project outcomes after its conclusion. This can be challenging if finance comes from external sources, or is tied to limited internal budget cycles. However, this could be addressed through two approaches:

1. Allocating municipal budgets based on approved strategies, rather than previous budget cycles makes it more likely to achieve strategic outcomes in the municipality;
2. Embedding a nexus strategy in municipal policy may lay a foundation for cross departmental budgeting and program implementation.

Snapshots of Each Case:

There are various entry points for nexus innovation. In the case of the IFWEN project, these cases were chosen as innovative initiatives because they were new in the context of where they were implemented. Their desired outcomes include agricultural productivity and food self-sufficiency, waste(water) management, disaster



risk reduction, environmental education and awareness, waste prevention and social wellbeing.

In **Florianopolis**, the Municipal Urban Agriculture Program (MUAP) was established in 2017 by a decree to increase food security. This was achieved by supporting the implementation of urban gardens, a market in the city where producers can sell their produce, and providing workshops on composting. The MUAP demonstrates how co-benefits can be generated by increasing food self-sufficiency. These include reduction of GHG emissions, increased water quality, urban flood mitigation, reduced energy use, sustainable waste management and increased urban green areas. In addition, it reinforces the need for stakeholder engagement as support from the local community and municipality were crucial for the initiative to take place. The project also achieved the implementation of a municipal law which will facilitate the project's expansion in future years [1].

The FWEN innovation in **São José dos Campos** (SJC) includes the creation and management of the first Brazilian municipal Environmental Protection Area (EPA), the Banhado EPA. This was achieved by using resources from private companies' environmental compensation fund. This EPA offers protection to the floodplains of the Paraíba do Sul River, which is a main water source for SJC, as it restricts construction on the site and limits the amount of livestock and agricultural research allowed to take place. This has indirect positive impacts on water and food provision, as well as energy production. The EPA is a strong example of participatory management as the environmentalist movement and city representatives share an understanding of the ecological importance of the floodplains. This was reflected in the policy created to regulate the area and the implementation of a municipal law to protect the area [2].

In **Gangtok**, the FWEN innovation consists of a bio-composting plant piloted by the Gangtok Municipal Corporation (GMC) in 2018 which was designed to enable compliance with Solid Waste Management Rules. The project was funded externally through the ACCCRN Small Grants Program, and technical advice was provided by ICLEI South Asia. The composter was installed in the Kanchenjunga Shopping Complex where organic farmers sell their produce, with GMC being responsible for land provision, and the operation and maintenance of the plant. The plant provider installed the composter and conducted

hand-holding and capacity building exercises for city staff. This study demonstrates that the key to a successful project uptake is establishing a properly-targeted, large-scale awareness program before proceeding with technical installation. This project is also exemplary in successfully closing the food waste loop and reducing pressure on the city's solid waste system. This in turn reduces fuel costs and limits the waste which enters jhoras (small drainage systems). Capacity-building and awareness-raising, the presence of relevant policy, engaged leadership, and support from global city networks are key themes in this study [3].

For the case of **Nagpur**, Nagpur Municipal Corporation (NMC) and Maharashtra Power Generation Company (MahaGenCo) partnered in the construction and operation of a wastewater treatment plant, funded by the central and state governments, as well as MahaGenCo and NMC. This case study highlights multiple examples of well-coordinated support schemes and initiatives at different levels. This project has resulted in a major transformation to improved water quality, with nearly 90% of wastewater being treated and households having greater access to freshwater for irrigation. This case study also demonstrates the importance of institutional coordination, presence of national programs and relevant policy, and public-private partnerships [4].

The **Taipei** Garden City (TGC) policy began as a grassroots gardening movement in 2014 and promotes urban farming. The policy has led to the development of 740 small edible gardens across the city, creating a network of almost 213,000 m² of greenspace. These greenspaces contribute to closing resource loops via renewable energy technologies, rainwater harvesting systems and composting schemes. One of the main reasons for TGC's success is the variety of garden types and locations that it allows for, since the districts of Taipei vary significantly in terms of population density and access to greenspace. The policy includes numerous public and private actors in a coordinated, collaborative effort. The policy's key features include enhancing state-citizen relations, empowering NGOs in governance processes, developing greenspaces in a bottom-up way that better fits local contexts, and expanding educational, recreational and nutritional opportunities for vulnerable populations [5].

An innovative initiative in **Antananarivo** is the PRODUIR project. It was led by the Ministry of Planning and funded externally. It is an example

of a sanitation network being improved in the most vulnerable areas of the city. Small investment projects guided by micro-master plans were co-created by relevant stakeholders in the local community. This was instrumental in building knowledge, trust, and social cohesion. Utilising a multi-stakeholder approach, investing in local capacities, knowledge exchange, receiving regular feedback, and basing strategies on best practice examples were key for the PRODUIR project achieving its goals [6].

For the case of **Dodoma**, FWEN innovation took place in Chololo Village. The project was developed with local and national partners, and funded internationally. Farmers were trained in climate-smart practices and were encouraged to report on which systems were most effective in order to inform decision making. The community's adaptive capacity was increased through improving resource access and efficiency via solar panels, rainwater collection and storage, and biogas digesters. Longevity of project implementation, and improved economic development was supported through various skill building programs. Chololo village is an excellent example of participatory planning being successful in improving agricultural productivity and energy efficiency whilst simultaneously reframing Chololo as an eco-village [7].

The UNA Rivers Project in **Lilongwe** is a pilot project by ICLEI Africa aiming to support river system health by preventing waste contamination. Food waste made up the majority of the contamination

so the project focused on intercepting waste from a local food market. Using a gender inclusive lens, the project supported women working in the market collecting waste for composting by offering training and setting up a composting site. The project was successful in reducing waste to a certain extent. However, the project's limitations act as a powerful lesson and illustrate the importance of multi-stakeholder engagement where stakeholders can influence the design, planning, and implementation of projects, as well as the importance of understanding the social context [8].

The nexus project in **Johannesburg** consists of the School Greening Project which ran annually from 2013 to 2017 as part of the City's Environmental and Infrastructure Services Department environmental education efforts. It offered experiential and activity-based education focusing on resource productivity and caring for the environment. 41 schools in vulnerable communities were provided with equipment including food gardens, rainwater harvesting tanks, solar water heaters, outdoor classrooms and a biogas digester, to aid this process. A challenge for this project was an imbalance between the time needed to ensure school stakeholders became familiar with the technology, and the short budget period of the city's financial year. Lessons from this case showcase how a nexus approach can create synergies between government departments and increase systems thinking capabilities of city actors into the future [9].



Photo credit: ICLEI - Local Governments for Sustainability



References and Further Reading

- [1] S. Gouvea, L. Heinisch, V. Ferraz, "Urban agriculture and community engagement," Florianopolis, Brazil; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Florianopolis_FINAL.pdf.
- [2] S. Gouvea, L. Heinisch, V. Ferraz, "Participatory management for urban forest conservation," Sao Jose dos Campos, Brazil; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Sao%20Jose_FINAL.pdf.
- [3] R. Fernandes, R. Singh, M. Sen, "Closing the loop in the waste management and food sectors," Gangtok, India; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Gangtok_FINAL.pdf.
- [4] R. Takur, M. Sen, "Innovation for increased efficiency in the water-energy nexus," Nagpur, India; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Nagpur_FINAL.pdf.
- [5] E. Hellmer, W. Shih, A. Hartung, "Education and land-use reforms as urban nexus innovations," Taipei, Chinese Taipei; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Taipei_FINAL.pdf.
- [6] P. Currie, "Using nexus for tackling the challenge of extreme poverty," Antananarivo, Madagascar; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Antananarivo_FINAL.pdf.
- [7] P. Currie, "Climate resilience through nexus interventions," Dodoma, Tanzania; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Dodoma_FINAL.pdf.
- [8] P. Currie, "Waste as the entry point for GBI and nexus intervention," Lilongwe, Malawi; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Lilongwe_FINAL.pdf.
- [9] P. Currie, "Schools as the center of learning about nexus," Johannesburg, South Africa; *Case Study Series for Understanding Innovative Governance for Food, Water, and Energy Nexus in Cities (IFWEN) Project*; ICLEI, July 2021. Available at: https://e-lib.iclei.org/publications/IFWEN_Joburg_FINAL.pdf.

SPONSORED BY THE



This publication was developed based on the research conducted under the SUGI-IFWEN project, which was funded by the German Federal Ministry of Education and Research as part of its Social-Ecological Research funding priority, funding no. 01UV1802. The responsibility for the content of this publication lies with the authors.

Authors

Pourya Salehi
Paul Currie
Anina Hartung
Ralitsa Shentova

Design

Amy Jones

COPYRIGHT

© 2021 ICLEI - Local Governments for Sustainability e.V. All rights reserved. The ICLEI World Secretariat holds the copyright of this publication, including text, analyses, logos and layout designs. Requests to reproduce or to quote material in part or in full should be sent to urban_research@iclei.org. ICLEI encourages use and dissemination of this case study, and permission to reproduce this material without modification will usually be permitted without charge for non-commercial use.

ICLEI – Local Governments for Sustainability is a global network of more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development. Our Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

Contact Us

Kaiser-Friedrich-Str. 7
53113 Bonn | Germany
Tel. +49-228 / 97 62 99-00

