The Necessity of Local Leadership Engagement in Implementing Impactful Food-Water-Energy 'Nexus' Solutions

ICLEI Local Governments for Sustainability

IFWEN

Policy Brief **April 2022**

Executive Summary

Leaders are combining food, water, and energy systems in new ways to address varied and complex problems of climate change and urban sustainability. Persistent issues such as waste management, food insecurity, and energy dependency require new and innovative solutions. This policy brief highlights the need for managing the interplay between food, water, and energy systems and emphasizes a four-point leadership framework for Food-Water-Energy Nexus (FWEN) solutions in urban communities. The framework details how leaders are needed to break down current, 'siloed' barriers and form effective solutions for change. Food, water, and energy systems underlie and constitute major resources in urban settings.

Framing the Problem

In 2021, urban areas worldwide became home to more than 54 percent of humanity - 4.46 billion people who consume 70-75% of natural resources, drawing primarily on ecosystems beyond city boundaries [1] [2]. The interconnectedness among different ecosystems, especially in providing water, energy, and food, has now become a global concern that is further exacerbated by global climate change. For example, clearing forests for agriculture currently contributes to increased flooding and landslides; drawing on water basins for energy generation has reduced drinking water availability; importing food over long distances increases energy consumption and waste. Inefficient, interdependent resource management causes negative impacts that increase resource scarcity, waste, and vulnerabilities, including health risks [3].

The above problems demonstrate the interplay between the different environmental systems of food, water, and energy. Left unaddressed, such problems further increase already high costs of urban infrastructure maintenance, logistics, and public health burdening municipal budgets. Fortunately, solutions and tools are available that turn these 'nexus' challenges into opportunities. The Food-Water-Energy Nexus (FWEN) approach finds solutions that combine these different streams. The Nexus concept means "to connect," and examples of solutions include urban agriculture, constructed wetlands, riverine lake systems, and increased vegetation along drainage systems. When ideated and operationalized effectively and with a systems approach, many of these solutions have the potential to provide secondary benefits such as stimulating economic activities. FWEN creates such opportunities by combining food, water, and energy systems [4] with effective leadership and governance.

Green and Blue Infrastructure (GBI) refers

to natural and semi-natural spaces using vegetation (green) and water bodies (blue) to provide water purification, temperature regulation, flood control, and recreation. GBI can improve the FWEN in communities and cities worldwide, mitigate the negative impacts of urbanization and support the development of a circular economy in which a closed loop is created in producing and consuming goods. A circular economy benefits both businesses and the environment by optimizing the use of renewable resources, the lifecycle of products, and how materials are reused. GBI uses landscape elements that provide nature-based solutions (environmental services) by including parks, street trees, community food gardens, lakes, rivers, and wetlands to improve urban environmental conditions and, in turn, citizens' health and quality of life [5]. Solutions are shown in Figure 1. Additionally, GBI does not require a carte blanche in to be effectively implemented. GBI can substitute or complement conventional (or gray) existing infrastructure at a lower cost to address climate change impacts, such as floods, landslides, and droughts.

Ideating and implementing novel solutions within energy-water, water-food, and food-energy nexus areas does require public and private leadership. Leadership is needed to bring organizations and jurisdictions together to consider new creative solutions that FWEN offers. Some communities are driven to this new approach when, in the past, organizations and jurisdictions have failed to consider the interdependencies of ecosystems resulting in imbalances in the FWEN that lead to deforestation and organic waste streams, for example. These failures often occur when systems are governed in isolation - or as silos – by separate jurisdictions or organizations with little incentive for working together. Siloed governance is leading to conflicts of interest, inefficiency in resource management, and economic loss. In this way, working in siloes undermines the actual capacity of subnational governments to instigate positive change. Many successful FWEN efforts show the benefits of collaborative governance in which public leaders play key facilitative roles that bring civil society and the private sector together for planning and implementation.

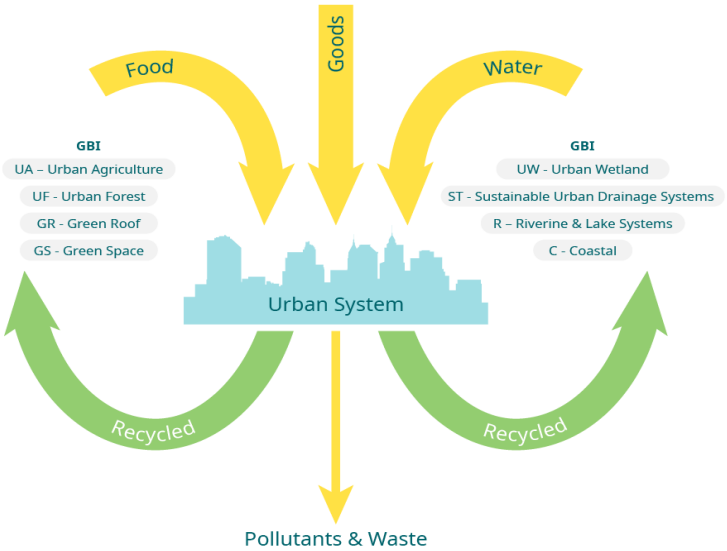

Figure 1: How Urban GBI can Improve City Metabolism – Including more forms of GBI in urban systems can reduce pollutants and waste and reclaim outputs as new inputs. Source: Nexus Implementation Guidebook for Cities (FGV-EAESP & ICLEI, 2022)

Collaborative Governance: Facing Challenges Collectively

Collaborative governance is an innovative but well-established social technology for public governance that helps adopt GBI to improve FWEN solutions. Collaborative governance involves different organizations and jurisdictions making collective decisions and engaging in the implementation of these decisions through cooperation and collaboration. Urban problems typically involve many various stakeholders, and coordination and collaborative decision-making are critical to developing joint solutions and their deployment. Engaging all relevant stakeholders throughout the policy cycle stages – from agenda setting and formulation, adoption, implementation, to evaluation – facilitates collaboration across different organizations and jurisdictions to address many resource management challenges [6].

Collaborative governance starts with leaders helping the community and organizations to build awareness and understanding that a problem requires collective approaches and participation by organizations and jurisdictions. Typically, urban areas are already well aware of environmental issues requiring collective solutions, such as periodic flooding or water reservoirs reaching low limits. Collaborative governance helps turn these into priorities. In other instances, community groups are already taking limited action, such as in Taipei, where the city government identified the potential of existing local urban agriculture (UA) endeavors to provide vegetables and reinforce community ties. In these instances, collaborative governance acknowledges the problems underlying these efforts and identifies and builds on existing efforts in subsequent collaborative policymaking.

Collaborative governance is strategic and helps communities face their challenges collectively. It is strategic to identify the most critical problems or feasible to tackle. At any point in time, different urban areas will have various FWEN initiatives that suit them best. Collaborative governance also takes advantage of the increased leadership, expertise, and resources that multiple organizations and jurisdictions offer in tackling such problems. For example, the City of Gangtok piloted a bio-composting plant intending to close the food and waste loop. The initiative involves public and private stakeholders diverting organic waste from water streams to the new site, where this waste is converted into fertilizer for local farmers. Neither the City nor the private sector could have done this alone. Acting collectively turned this problem into an opportunity and, ultimately, an asset for both [7].

Of course, collaborative governance is not without challenges. Clearly, bureaucratic silos, overlapping jurisdictions, and the different mandates of responsible public authorities cause disagreements among officials, creating barriers to public sector climate adaptation and preparedness [8]. Social barriers may have left some groups out of current decision processes. Awareness of these matters, leadership is needed to leave siloed governance behind, that can envision and create new opportunities, and bring relevant actors together to craft collective priorities and agendas. Subnational governments must develop a thorough understanding of how siloes exist within the institution and how they could be addressed through the identification of overlaps and opportunities for inter-departmental collaboration. This requires a designated actor within the organization to assess the situation and the skills that exist internally. The public sector often looks to the private sector for expertise when some of the necessary strengths may already be present internally. Developing this initial understanding of organizational siloes and capacities before addressing siloes in the broader urban context can significantly help develop the leadership needed to attract and mobilize new resources and build plans for successful implementation. The following section offers leaders a framework for FWEN.

Engaged Leadership Framework for FWEN in Cities

Goal-oriented strategic planning provides a practical framework for collaborative governance in FWEN. The following four-point framework helps leaders harness the collective power of the organizations and jurisdictions to effect change [9]. Engaged leadership can be successful when following these four steps:

- Framing the problem and identifying needs and opportunities
- Engaging collaborators and stakeholders
- Designing of efforts and Decision-making
- Implementation and management

Framing the problem and identifying needs and opportunities is the first step. Research on climate policy implementation demonstrates that the extent of local government power is mainly in the sanitation, transport, and land use sectors. The literature highlights the importance of individual politicians and city officials concerning the rise of urban climate governance [10] [11]. Leaders who are champions of urban climate governance have a critical role in driving urban sustainability agendas, deciding strategically on which issues they seek to lead, increasing awareness, leading in new ways of governing ecosystems and resources, and overcoming siloed approaches [12]. Municipal governments usually have the means to support this by mapping critical areas or the need for improved infrastructure.

Leadership should search for innovative and holistic approaches, sometimes building on the already existing community and business efforts, which are sustainable in the medium to long term. However, resources and funding mobilization is always of concern. In recent years, new funding streams have become available from higher governments and private foundations, and ICLEI has made new tools available to help find and access these resources. Taking advantage of these opportunities requires well-informed, data-led, skillfully developed proposals and a commitment to collaboration. Leaders often empower staff to participate in framing problems and developing new funding opportunities [13].

Engaging collaborators and stakeholders is critical to bridging silos. Enabling spaces for discussion can help decision-makers engage with and understand available evidence, tapping into the knowledge and abilities of the diverse actors operating in FWEN in cities. Leaders (individuals, groups, or organizations) can motivate other relevant actors to work together. Convening internal and external collaborators and stakeholders help galvanize the support to connect items on the political agenda [16]. For example, the City of Johannesburg in South Africa has convened a large group of internal and external stakeholders to map opportunities for better resource management. The group identified waste management, pollution, ecological degradation, and failing infrastructure as priorities to address by the City [7]. The collaborative identification of issues and opportunities is integral to fostering a healthy and engaged local network across government, civil society, academia, and the private sector towards ongoing shared efforts to address complex issues.

Of course, while broad participation also gives voice to critics, the message of environmental improvement and collective action with tangible results is positive. Engaging collaborators and stakeholders also allows for a shared vision among those who wish to participate while broadening inputs and expertise for possible design and subsequent actions. In collaboration, the most fruitful outcomes are often developed through the navigation of conflict. Conflict demonstrates that a process of cooperation is inclusive of varied perspectives, and as long as constructive, it should be received as an asset to the process. The key to using conflict in collaborative processes to develop better outcomes is fostering dialogue through which a 'middle way' is reached to proceed instead of trading off one side of a conflict. Cross cross-sectoral collaborations can be strengthened in the skillful navigation of conflict to find a middle way.

Design of efforts and decision-making often takes on multiple forms. FWEN projects are often collaborative, involving community efforts, public-private partnerships, and funding and/or policy support from higher levels of government. All of these are well-known and established instruments. In Florianópolis (Brazil), local leadership successfully combined a bottom-up effort with a top-down one, thereby structuring regulation to promote urban agriculture while improving waste management [7]. It also scaled up a community composting initiative to over 100 other points in the City. Differently, in Nagpur, India, the municipal authority led the development of a public-private partnership (PPP) to improve and expand the City's sewage treatment. This involved a PPP among the provincial and national governments and a wastewater treatment company [7]. Always collaborative, more significant private sector investments

often involve public-private partnerships.

Interactions and designs with higher levels of government and international organizations are increasingly common. More and more, higher governments have adopted policies and programs in support of environmental system solutions and strengthening governance at local levels. Efficient and effective management of FWEN also requires understanding challenges and solutions that should move between experts and stakeholders [14]. This interchange ensures that the knowledge of local stakeholders can inform decisions that are made. This is critical when the outcomes of decisions will impact local stakeholders and in situations where the uptake of stakeholders of a project or solution will play a role in its success. In any event, whatever design is selected will eventually be formalized by the decisions of jurisdictions and funding organizations.

Implementation and management need committed leadership to deal with further challenges. Public performance management is increasingly used to ensure a target- and accountability-based approach to implementation. Such approaches build on clearly stated logic models that identify short- and medium-term indicators of success. Political, institutional, economic, social, and environmental circumstances may change, and coping with a dynamic context depends on a plan in which indicators are periodically updated, and responsibilities and roles are clearly assigned and defined. While public managers need to be empowered to positively respond to change, committed and engaged leadership follows up on the initiative's progress, strengthens collaboration networks, and enables participants to implement successful FWEN solutions. The flexibility to respond to dynamic contextual changes and the continuity of leadership working on initiatives with a long-term scope are critical to the success of projects and should be further integrated into implementation and management strategies.

Examples from the Global South

Strategic Planning and Assessment in Johannesburg, South Africa

As part of an exercise to identify and prioritize the drivers of environmental problems, the City of Johannesburg convened stakeholders from municipal departments and entities for a workshop. Participants identified 65 challenges that were merged where necessary into 49 particular issues and grouped under 16 themes. Participants then voted for the three most pressing issues to improve environmental and social sustainability. It was helpful to note how many issues were articulated per theme and where the city officials believed action would be most effective and lead to widespread co-benefits. Some themes were incorporated throughout the proposals; for example, the theme "Inequality" is an ever-present priority for the City and is embedded in other specific themes, such as Informal Settlements, Food Insecurity, Waste Management, and Infrastructure Planning.

For the detailed case study, see https://e-lib.iclei.org/publications/IFWEN_Joburg_FINAL.pdf

Public Private Partnership for FWE Nexus in Nagpur, India

In Nagpur, rapid urban growth has led to a greater demand for energy and water. There was an urgent need to mitigate urban water stress by creating innovative alternatives to freshwater in power plants. Additionally, the discharge of sewage from the City had resulted in the contamination of agricultural lands beyond the City. Nagpur Municipal Corporation (NMC) had to improve and expand its sewage treatment capacity or face legal charges. A 130 MLD, sewage treatment plant (STP) was commissioned in 2016 to reduce the demand for clean water in power plants, improving water quality for agriculture and sanitation. Leadership addressed financial constraints by establishing a Public-Private Partnership between the NMC, the wastewater treatment plant owner, and the MahaGenCo enterprise, responsible for its operation and maintenance. The collaborative effort resulted in the NMC

negotiating for additional freshwater to meet its increasing demand and securing the STP as a long-term asset. NMC also received funds from the provincial Government of Maharashtra (GoM) and the Government of India. The resulting STP is financially viable, and part of the revenue is shared between MAHAGENCO and NMC.

For the detailed case study, see https://e-lib.iclei.org/publications/IFWEN_Nagpur_FINAL.pdf

Urban Agriculture and Waste Management in Florianópolis, Brazil

The Municipal Urban Agriculture Program (PMAU), established in June 2017, promotes urban agro-ecological practices. The initiative enhances co-benefits, such as repurposing land use within the urban context and maintaining clean and litter-free urban areas while promoting community participation and engagement. The City's waste management department and CEPAGRO, an agroecology NGO, provided technical guidance to community volunteers on separating organic waste for composting. The training helped maintain the composting facilities and the gardens, which are now open to the public.

The policy enabled the City to allocate a budget to urban agriculture in the various departments involved. The initiative increased city reuse of organic waste by composting and repurposing material for organic urban gardens. The City also increased food independence for vulnerable neighborhoods, increased autonomy for waste management, and reduced landfill waste. Residents benefitted from cleaner water and improved environmental and health conditions in their neighborhoods.

For the detailed case study, see https://e-lib.iclei.org/publications/IFWEN_Florianopolis_FINAL.pdf

Key Points

The interconnectedness of ecosystems poses many significant urban challenges. Food, water, and energy are resources that underpin human well-being and wealth worldwide. Increasing pressure on these resources from rapid urbanization processes and unsustainable production and consumption models presents a significant challenge for decision-makers. The FWEN approach proposes the innovative use of blue and green infrastructure to address these challenges and produce opportunities. As the case study from Nagpur, India demonstrates, these opportunities can be in the form of new partnerships between stakeholders that develop a more circular economy, resulting in environmental regeneration and economic opportunity.

Strong leadership that leverages collaborative governance and existing local capacities and projects is essential to bridge siloes that exist in decision-making and operationalize initiatives to realize FWEN solutions. FWEN solutions need to be context-specific, involve local stakeholders and use a shared understanding of priority issues to design projects that leverage available resources to maximum effect. Effective leadership for implementing FWEN strategies involves four main steps:

- Framing the problem and identifying needs and opportunities for FWEN
- Engaging collaborators and stakeholders
- Designing of FWEN solutions and decision-making
- Implementing and managing FWEN strategies to success

References

[1] United Nations, Department of Economic and Social Affairs, Population Division (2018). World Urbanization Prospects: The 2018 Revision, Online Edition. [Accessed: 10-Apr-2022].

[2] UNEP, "Resilience and Resource Efficiency in Cities," 2017. [Online]. Available: https://wedocs.unep.org/bitstream/handle/20.500.11822/20629/Resilience_resource_efficiency_cities.pdf?sequence=1&isAllowed=y. [Accessed: 23-Sep-2020].

[3] R. E. Engström et al., "Research and Innovation Needs to Decarbonise European Cities," DEEDS Policy Brief #4, 29-Apr-2020. [Online]. Available: https://deeds.eu/wp-content/uploads/2020/04/DEEDS-Policy-Brief-4-Cities.pdf. [Accessed: 30-Sep-2020].

[4] FAO, "The Water-Energy-Food Nexus - A new approach in support of food security and sustainable agriculture," 2014.

[5] L. Mazza et al., "Green Infrastructure Implementation and Efficiency," 2011.

[6] Ansell, C., Gash, A., 2008. Collaborative Governance in Theory and Practice, Journal of Public Administration Research and Theory, Volume 18, Issue 4, October 2008, Pages 543–571, https://doi.org/10.1093/jopart/mum032

[7] ICLEI – Local Governments for Sustainability. Closing the Loop: Innovation for Increased Efficiency in the Food-Water-Energy Nexus. Case Studies. 2021. Available from https://www.iclei.org/en/publication/ifw-en-case-study-series [Accessed: 14-Apr-2022].

[8] M. D. Leiren and J. K. S. Jacobsen, "Silos as barriers to public sector climate adaptation and preparedness: insights from road closures in Norway," Local Gov. Stud., vol. 44, no. 4, pp. 492–511, Jul. 2018.

[9] J. Torfing and C. Ansell, "Strengthening political leadership and policy innovation through the expansion of collaborative forms of governance," Public Manag. Rev., vol. 19, no. 1, pp. 37–54, Jan. 2017.

[10] Ye Qi, Li Ma, Huanbo Zhang, and Huimin Li, "Translating a Global Issue into Local Priority," J. Environ. Dev., vol. 17, no. 4, pp. 379–400, Dec. 2008.

[11] J. Carmin, I. Anguelovski, and D. Roberts, "Urban Climate Adaptation in the Global South," J. Plan. Educ. Res., vol. 32, no. 1, pp. 18–32, Mar. 2012.

[12] W. Y. Shih, L. Mabon, and J. A. Puppim de Oliveira, "Assessing governance challenges of local biodiversity and ecosystem services: Barriers identified by the expert community," Land use policy, 2020.

[13] Julio C Zambrano-Gutiérrez, Jose A Puppim de Oliveira, The Dynamics of Sources of Knowledge on the Nature of Innovation in the Public Sector: Understanding Incremental and Transformative Innovations in Local Governments, Journal of Public Administration Research and Theory, 2021; muab053, https://doi.org/10.1093/jopart/muab053

[14] K. J. Helmstedt, J. R. Stokes-Draut, A. E. Larsen, and M. D. Potts, "Innovating at the food, water, and energy interface," Journal of Environmental Management, vol. 209. Academic Press, pp. 17–22, 01-Mar-2018.

SPONSORED BY THE

Federal Ministry of Education and Research

FONA Social-Ecological Research

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

Evan Berman [a]
Laura Valente de Macedo [ab]
Pourya Salehi [c]

Editors

Pourya Salehi [c]
David Corbett [c]

Design

Amy Jones [c]

Affiliations

[a] Getúlio Vargas Foundation – São Paulo School of Business Administration (FGV-EAESP)

[b] Global Cities Center at the Institute of Advanced Studies, University of São Paulo (IEA/USP)

[c] ICLEI Global – Local Governments for Sustainability, World Secretariat

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

ICLEI Local Governments for Sustainability

Source of Figure

Figure 1. FGV-EAESP and ICLEI. Macedo, L.S.V., de Oliveira, J.A.P., Bellezoni, R., Salehi, P., Currie, P., Jones, A. 2022. Nexus Implementation Guide - Innovating in Urban Green and Blue Infrastructure to Improve the Food-Water-Energy Nexus: An Implementation Guide for Cities and Subnational Governments." (In press).

SPONSORED BY THE

Federal Ministry of Education and Research

FONA Social-Ecological Research

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.

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

ICLEI Local Governments for Sustainability