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A SYSTEMS APPROACH
POLICY BRIEF

# Facilitating the Governance of Urban Sustainability and Resilience Transitions with Knowledge-Action Systems Analysis

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1. Transition governance models are needed to help cities address sustainabiliy and resilience challenges through collaborative, integrative, and multi-actor network approaches.
2. Governance innovations require that we understand where are we starting from (e.g., how existing institutional conditions work) and where are potential leverage points for innovations and change in governance.
3. KASA is a systems-based framework to help map current governance networks, evaluate the extent that the structure, social preferences, and knowledge systems of these networks enable or constrain transitions, and identify leverage points or interventions for change.
4. The application of KASA in San Juan, Puerto Rico, revealed that a diverse network of organizations existed, including civic organizations, but there were sites in the network that could pose barriers to transitions, and therefore need institutional innovation.
5. Beyond merely analyzing governance structures, the KASA approach allows an examination of how cities think – what different governance actors know about the city, how they know and experience the city, and how they envision the city.

## About the author

Tischa Muñoz-Erickson is a Research Social Scientist with the International Institute of Tropical Forestry (IITF) in Río Piedras, Puerto Rico, a research institute within the U.S. Department of Agriculture's Forest Service. She leads the IITF's International Urban Field Station and the San Juan Urban Long-Term Research Area (ULTRA). She also currently leads research with the National Science Foundation's Urban Resilience to Extreme Weather-related Events Sustainability Research Network (UREx SRN) and the Smart and Connected Communities Resilient Coastal Cities (SCC RC2), as well as with the USAID Climate Resilience program in Santo Domingo, Dominican Republic. Tischa conducts research on governance for urban resilience and sustainability including knowledge networks and knowledge systems innovations, futures scenario development, and visualization technologies to build anticipatory capacities in urban planning and governance in the U.S., Puerto Rico, and other Latin America and Caribbean cities. As part of her transdisciplinary research, Tischa is actively involved in developing social arrangements and tools to facilitate the co-production of knowledge and strategies in support of sustainability transitions. She holds a Ph.D. in Sustainability from Arizona State University and an M.S. in Environmental Science and Policy from Northern Arizona University.

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## Wicked urban resilience challenges

On a global level, cities are increasingly leading the way in developing actions to address sustainabiliy and resilience challenges. Yet, many of these challenges, such as climate change, public health, and social justice, are too large, dynamic, and complex for city governments to address on their own. Governance and policy scholars call for a shift from top-down managerial government model to more collaborative, multi-actor network approach. This new transition governance model is characterized by:

1. systems-based and flexible management approaches that do away with agency boundaries in favor of institutional integration and coordination,
2. 'opening' of governments structures to include multiple voices, values, and visions in the development and steering of transition pathways,
3. co-production of knowledge, scenarios, and strategies where government officials, civic society organizations, private sector, and researchers collectively identify problems, produce knowledge, and put that knowledge into action through collaboration, synergy in implementation, and adapting processes.

These governance innovations require that we understand where are we starting from (e.g., how existing institutional conditions work) and where are potential leverage points for innovations and change in governance. This project seeks to support the research, design, and practice of urban governance transitions through the development of a systems-based governance analysis framework- the knowledge-action systems analysis (KASA). KASA is an interdisciplinary framework to help map current governance conditions and networks relevant to sustainability and resilience, evaluate the extent that the structure, social preferences, and knowledge systems of these networks enable or constrain transitions, and identify leverage points or interventions for change (Muñoz-Erickson 2014). Using tools and approaches from institutional, social networks, and knowledge systems analysis, the KASA aids city actors in knowing the 'terrain' of sustainability and resilience actors and initiatives in their cities, and to identify ways to better connect and work together in building climate resilience. Specifically, KASA provides a diagnosis of governance by,

- Describing who are the key actors involved (and not involved) in urban governance, and assess their perceptions, visions, and preferred actions with which to address sustainability and resilience,
- Exploring opportunities for improving connections, knowledge sharing, and collaboration among the multiple actors involved in sustainability and resilience efforts,
- Providing recommendations on key sources of knowledge and capacities needed to anticipate future uncertainties and envision potential strategies that bring both resilience and sustainability.
- Support the co-creation of future scenarios with multiple practitioners and stakeholders in cities to develop visions, goals, and strategies for urban sustainability and resilience transitions.

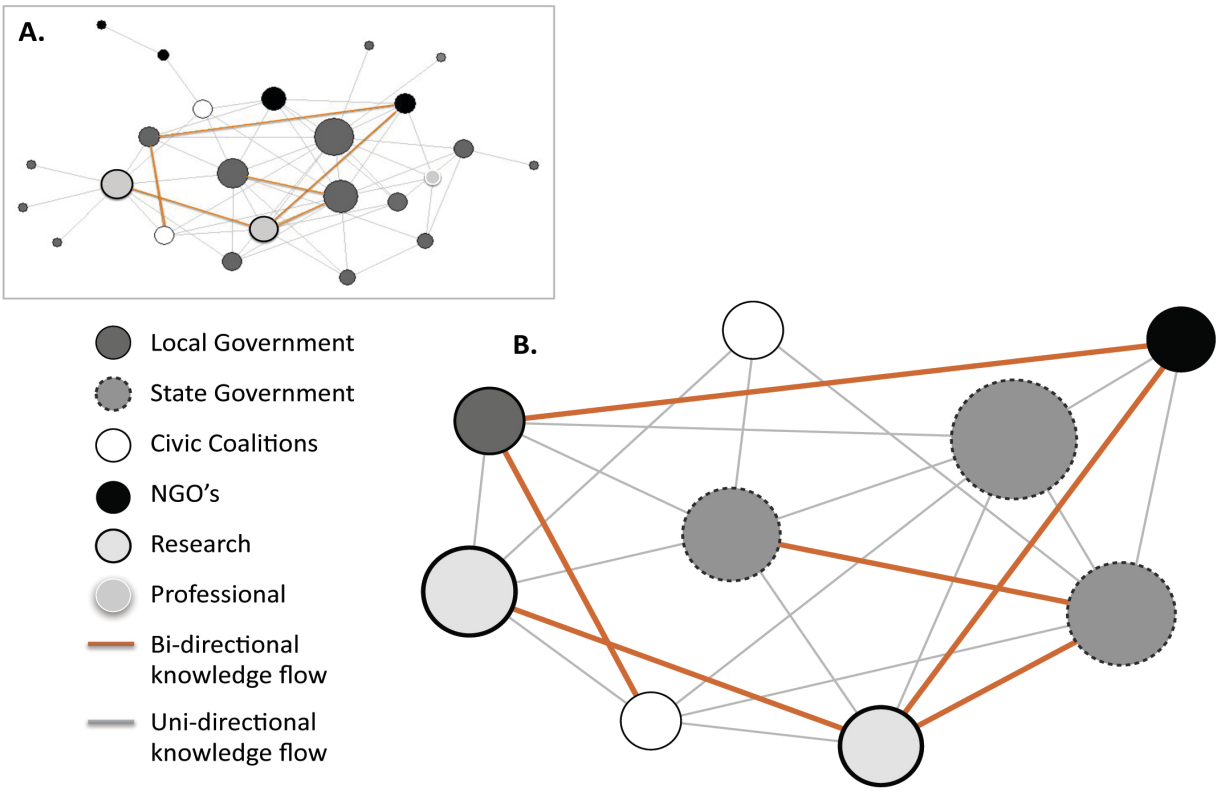


**Figure**: Network of knowledge flow among organizations involved in land use governance in San Juan, Puerto Rico. The figure on the top left (A) shows all organizations linked through knowledge flows. Different weights of the nodes means different levels of centrality, with greater nodes having greater influence over knowledge flow. The larger figure on the right (B) shows only the central actors in the network that have higher degree centrality and betweenness (i.e., brokers) and the reciprocal ties among them (in orange). (Muñoz-Erickson and Cutts 2016)

## Illustration of the KASA approach: urban land sustainability in San Juan, Puerto Rico

In 2009, increasing development and conversion of green space to construction and cement in the city of San Juan, Puerto Rico, especially in coastal areas and the forested headwaters of the city's main watershed, was producing numerous flood hazards throughout the city. Despite having a municipal land use regulatory framework that included protection of these green areas as part of the sustainable development of the city, unsustainable land development practices were still taking place.

The application of KASA in San Juan involved the mapping and analysis of the organizations and networks relevant to land use planning and sustainability, the frames and knowledge that were circulating across the network, and the influence (or power) that actors had on how that knowledge was applied in the land use governance context. While the analysis revealed that a diverse network of organizations existed, including civic organizations, that where involved in the production and use of knowledge regarding land use (Figure 1a), there were sites in the network that could pose barriers to the design of urban sustainability and resilience transitions, and therefore need institutional innovation. These included, for instance,

1) a significant breakdown in knowledge flow between the Municipality and the state's planning agency that acted as a barrier in communicating knowledge of local conditions to the state agency (Figure 1b);
2) distinct power asymmetries between the Municipality's visions and knowledge systems which included social dimensions of urban planning (e.g., quality of life and equity goals) and the state's hegemonic ideas of the city as a node for regional economic power;
3) fragmentation in the knowledge systems tasks and functions of organizations relevant to land use planning and decision-making instead of collaboration and alignment of agendas and strategies;
4) knowledge asymmetries were observed, with conventional knowledge types associated with state administration, such as economic and technocratic approaches to planning, have more influence in the network over other alternative types of knowledge (e.g., local, political, social, etc.).

## Future Directions for KASA

Beyond merely analyzing governance structures, the KASA approach allows an examination of how cities think – what different governance actors know about the city, how do they know and experience the city, how they envision the city. Cities are more than the physical and institutional infrastructure that service an urban population; they are also spaces where a high diversity of actors and their knowledge systems come together in networks that catalyze new ideas and innovations. The Urban Resilience to Extreme Events Sustainability Research Network (UREx SRN), an international network of researchers and practitioners addressing urban resilience and sustainability challenges through actionable knowledge in ten cities in the U.S. and Latin America, is applying the KASA approach to better understand the urban resilience governance context, how different actors are envisioning and innovating on resilient urban futures and scenarios, and identify potential interventions for innovations and change in knowledge and governance systems for resilience and sustainability transitions.

**References**:

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URBAN HEALTH AND WELLBEING
A SYSTEMS APPROACH

The *Urban Health and Wellbeing: a Systems Approach* (UHWB) programme, is a global science programme, of the International Council for Science (ICSU). The vision of the programme is: cities functioning as integrated complex systems which sustainably provide benefits for the health and wellbeing of its residents. It aims at (1) promoting and coordinating research, (2) developing and identifying data needs, (3) building and strengthening capacity and (4) communicating new knowledge.

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