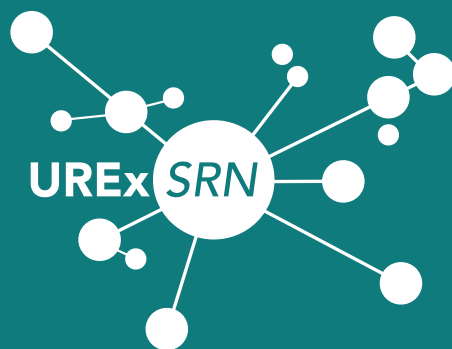


Climate Change Urban Resilience Scenarios in San Juan

WORKSHOP REPORT | FEBRUARY 3, 2017



Urban Resilience to
Extremes Sustainability
Research Network

www.URExSRN.net

Workshop Summary

Cities need to anticipate and orient their infrastructure decision in view of the climate changes that are generating a new global reality. With this purpose, the first workshop on Sustainable Visions for the Future was held in San Juan on February 3, 2017, to discuss climate change and urban resilience to extreme events. This activity is part of the initiatives promoted by researchers and practitioners from 10 cities in the United States and Latin America that participate in the Urban Resilience to Extreme Events Sustainability Research Network (UREx SRN). The UREx SRN is an initiative funded by the National Science Foundation (NSF) that seeks to support planning and urban development by generating future scenarios through a participatory and anticipatory process. This exercise can serve as a basis to promote resilience to extreme climatic events, such as urban and coastal flooding.

Approximately 51 practitioners, managers, decision-makers, civic and community organization leaders, designers, professors, and students from different institutions met at Hotel Verdanza to share and develop adaptive scenarios to extreme flood events, in addition to developing transforming scenarios, that is, scenarios for the desired future, transforming the city infrastructure. Using various activities, the participants defined goals and strategies for each scenario, specifying when and

where they would occur (see pages 5-8). At the end of the workshop, the participants presented their visions for San Juan 2080 using various methods, including narratives such as stories of imaginary characters living in San Juan 2080 using visual illustrations.

Next Steps

The UREx SRN modeling and visualization teams will take the results of the workshop scenarios to develop a quantitative model and other visualization approaches to project the urban infrastructure of San Juan in 2080 incorporating visions defined in the workshop. The models will be presented in a second workshop, which will focus on evaluating the results of the models through a multi-criteria evaluation that allows participants to refine strategies. We hope that the second workshop will lead to new ideas, initiatives, and connections that support the different sectors and organizations that are leading efforts to promote sustainability and resilience in the city of San Juan.

About the Urban Resilience to Extremes Sustainability Research Network (UREx SRN)

The goal of the UREx SRN project is to improve the resilience of urban social, ecological and technological systems in the face of the growing challenges that climate change poses to cities. The UREx SRN network includes ten cities affected by floods, heat waves and / or droughts. The network has a wide range of researchers from universities in the North and South, as well as municipal practitioners, members of the civil society and residents.

Through the co-development of scenarios in participatory workshops - such as those described in this document - we research possible transition pathways that will allow the transformation of cities to more sustainable futures.

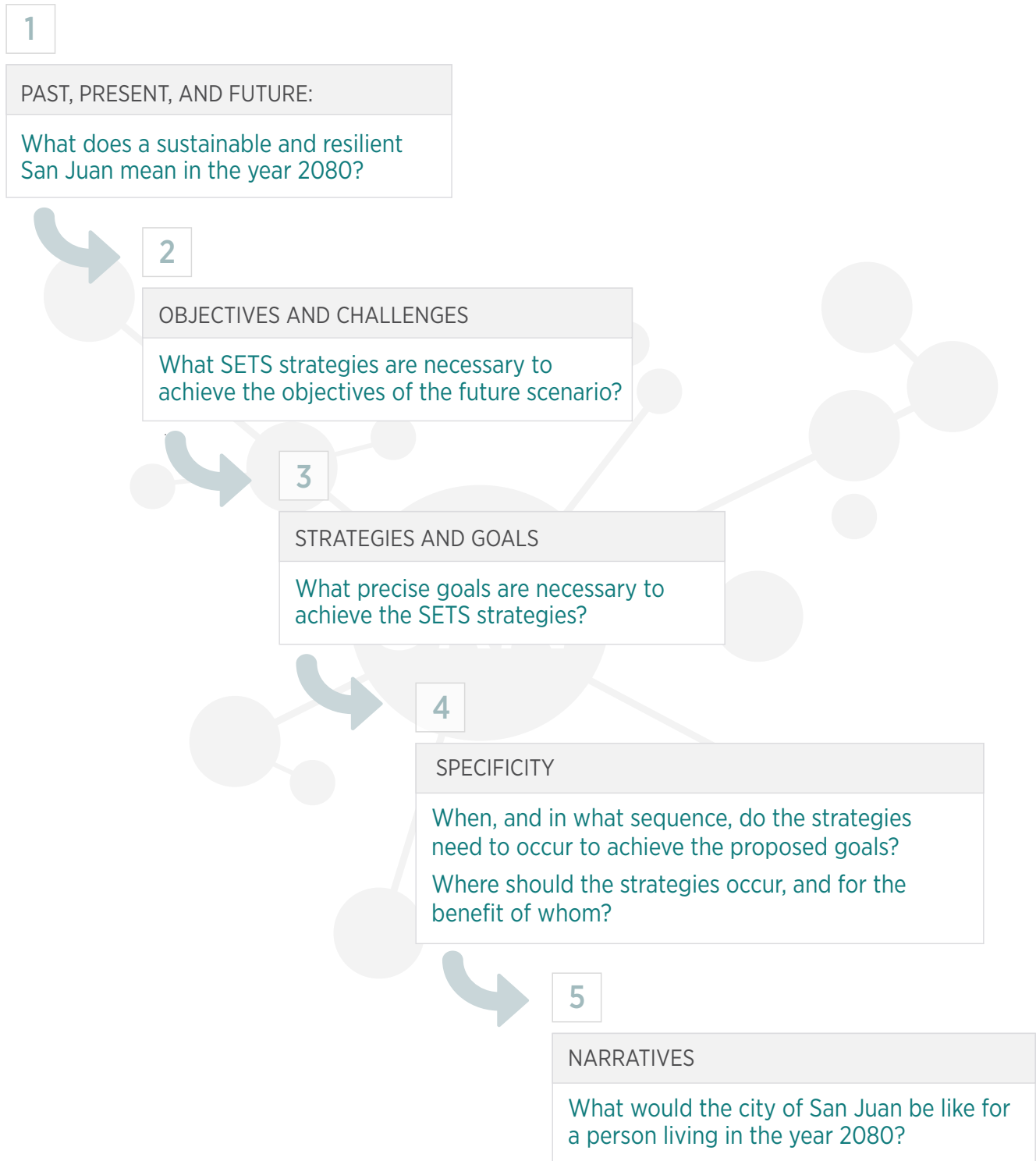
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Scenario Development Process

Workshop participants began by establishing and deliberating the main goals for a future San Juan that is more just, equitable, sustainability, and resilient by 2080. Several social, ecological and technological strategies were presented and imagined that have been implemented in adaptation and resilience interventions in other cities around the world.

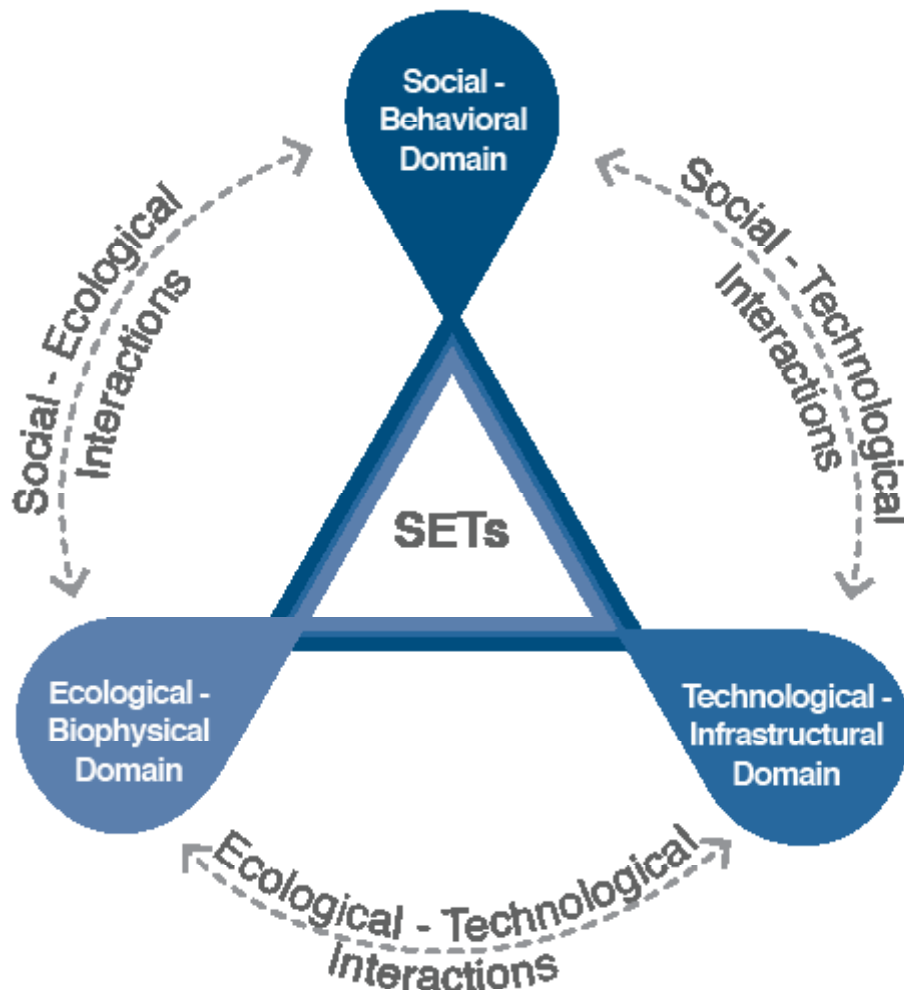
The UREx SRN team presented a vision of the city's infrastructure as a social, ecological and technological system (SETS) to help frame in an integrated manner the different dimensions of the city. Several activities were designed to facilitate scenario development based on the following questions:



Social-Ecological-Technological Systems (SETS)

Many of the problems we face today, such as climate change, social inequality, or environmental health, cannot be solved by traditional planning approaches. These are complex problems and with high levels of uncertainty that require the integration of different perspectives, experiences, and knowledge. One of the problems that challenges the planning and governance of cities like San Juan is how to create resilience to extreme external forces such as those posed by climate change that endangers lives, communities, and infrastructure in the urban system. When they are resilient, cities can persist, grow, and even transform, maintaining their functions and identity. The thinking of social-ecological-technological systems (SETS) integrates these three dimensions from a perspective of complex systems and is essential to promote resilience in cities and facilitate their transformation towards more sustainable futures.

Cities are complex SETS, and so too are parts of cities such as neighborhoods, parks, and infrastructure. The social dimension includes both decision makers and the people affected by them. The ecological dimension includes elements of a non-human nature that are part of the fabric of cities, for example, trees, soils, and water. The technological dimension includes the built components of cities, for example, the road system, buildings, or public transport networks. But perhaps the most important feature of the SETS approach is that it is a systems approach. This means that the social, ecological and technological elements are not considered separately, but rather as a whole and paying special attention to the relationships and interactions between the three dimensions.



Adaptive Scenarios

COASTAL FLOODING

Objectives and Challenges:

Voluntary relocation of coastal communities (county) to inland areas; Improve/strengthen coastal ecosystems; Community participation.

Strategy Examples:

- 1) Vulnerability inventory
- 2) Identify buffer zones and begin beach and dune nourishment strategies; Build artificial reefs, mangroves (i.e., 75% of county beaches restored by 2050 - 70% beach and dune nourishment, 15% reefs, 15% mangroves)
- 3) Create platforms for social participation and government education;
- 4) Dams, water pumps, identify physical infrastructure.



URBAN FLOODING

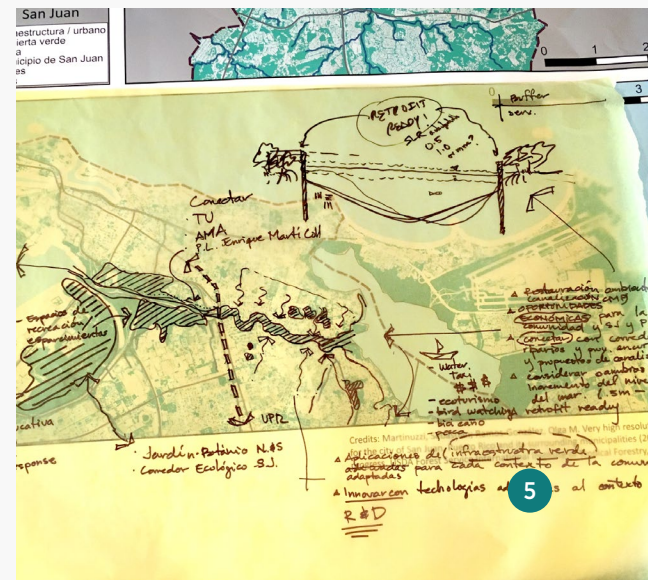
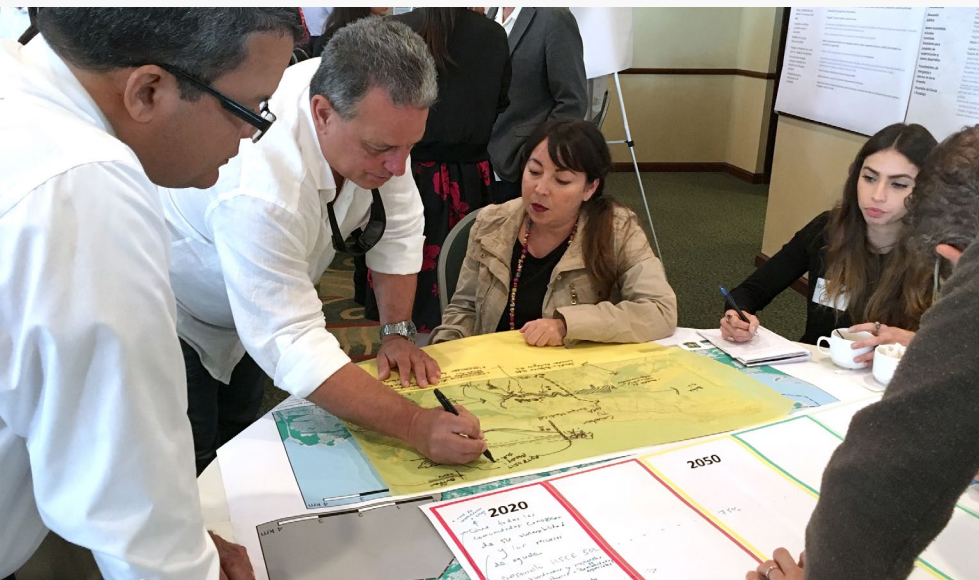
Objectives and Challenges:

Education to develop a culture of safety, care for nature, and adaptation; Focus on mitigation; Integrated development, design, management, and actions.

Strategy Examples:

- 1) Develop green and blue infrastructure that increases surface permeability
- 2) Biological filters and rain gardens near the Piedras River;
- 3) Clean and improve residual water system and pumps for areas equipped with storm water drainage pipes;
- 4) Improve the storm water system;
- 5) Create shelters in all flood-prone communities;

- 6) Restore the Martín Peña Canal and link with other green spaces in the city creating an ecological corridor;
- 7) Open access to the Piedras River with a linear park to encourage use and enjoyment by the residents and communities;
- 8) Development collective knowledge to deal with floods through education;
- 9) Develop a resource network (i.e. community yellow pages);
- 10) Integrate local knowledge and oral history to assess flood risks.



Adaptive Scenarios

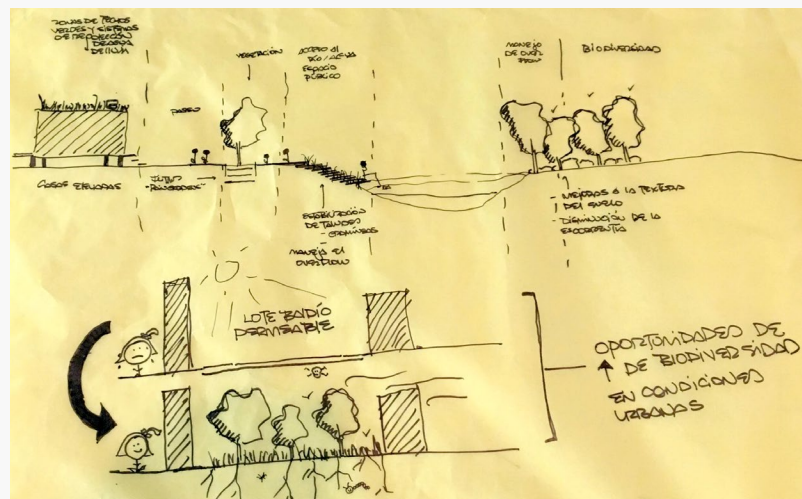
RIVER FLOODING

Objectives and Challenges:

Promote an integrated water management system; Integrate knowledge (technological, scientific, governance, and community); Improve the relationship between river and nature - a "Plus River" vision.

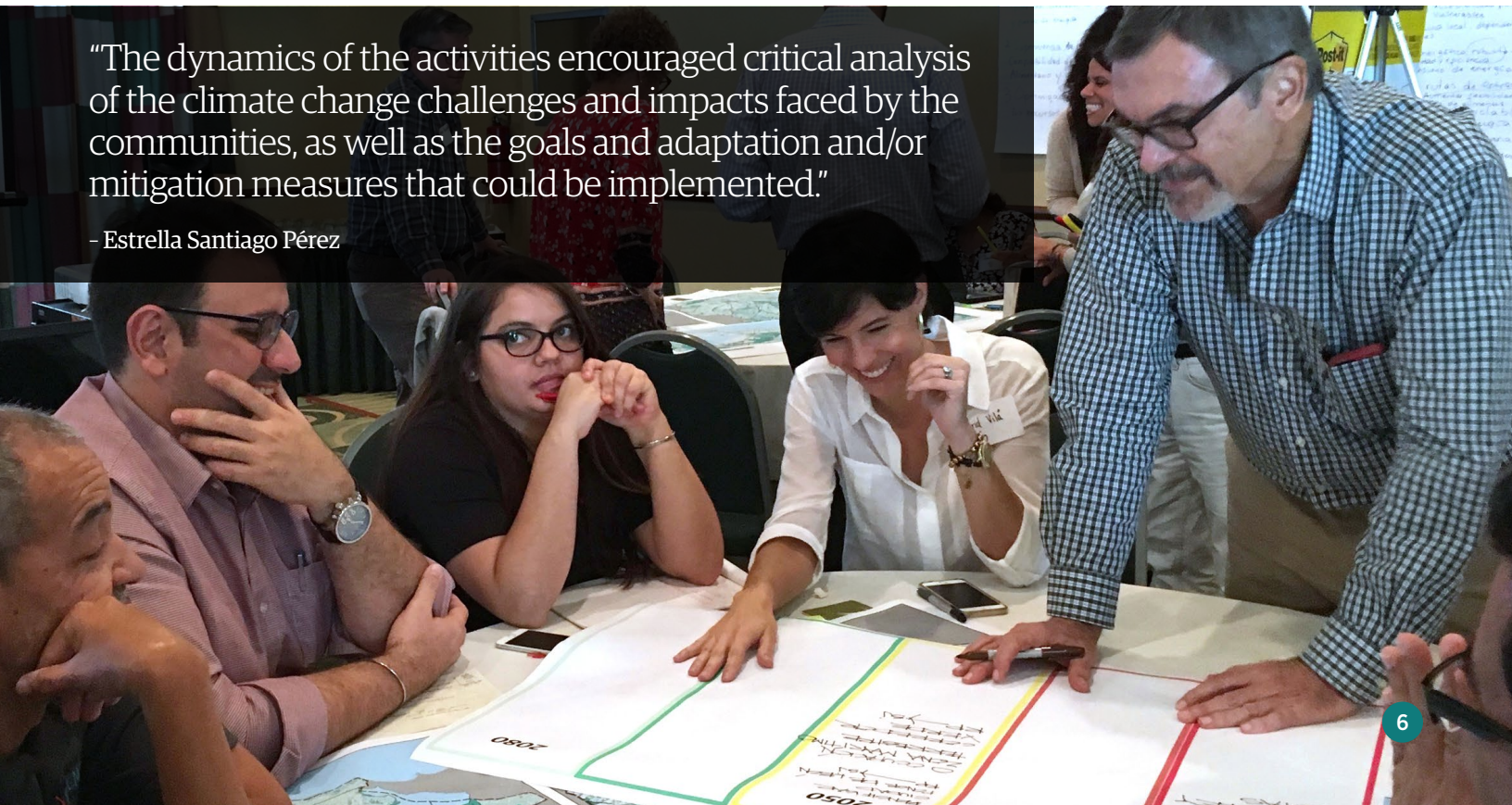
Strategy Examples:

- 1) Reduce gray infrastructure;
- 2) Elevate the buildings and plant rain gardens underneath;
- 3) Improve accessibility to the Piedras River (By 2050, 50% of the river will be accessible as a green / recreation area for the community);
- 4) Linear park around the Piedras River accessible by bicycle;
- 5) Improve septic systems; By 2050 all urban areas will be connected to the sewer system;
- 6) by 2080 there will be no gastrointestinal infection risks;
- 7) Integrated management and collaboration between agencies (i.e. create a water management board);
- 8) Monitor the river's water level;
- 9) Rain gage construction workshops for young people;
- 10) Information and capacity;
- 11) Flood information, monitoring and prediction systems;
- 12) Promote eco-tourism in the river.



"The dynamics of the activities encouraged critical analysis of the climate change challenges and impacts faced by the communities, as well as the goals and adaptation and/or mitigation measures that could be implemented."

- Estrella Santiago Pérez



Transformative Scenarios

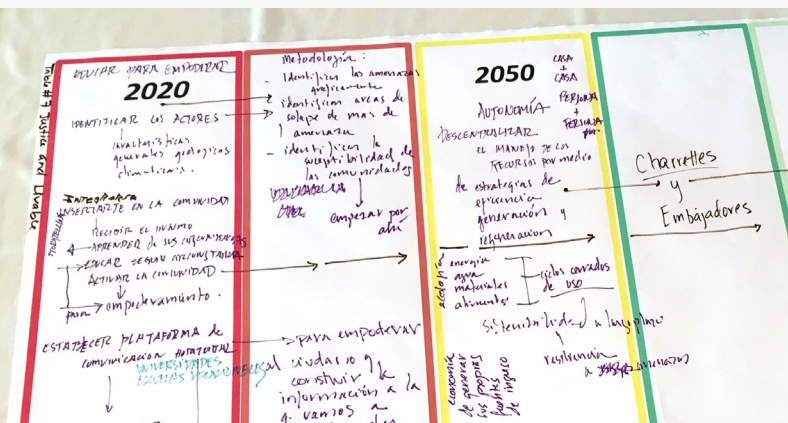
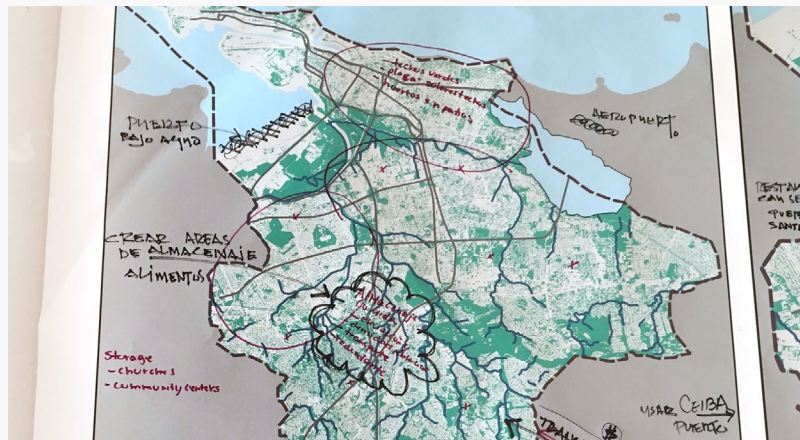
FOOD AND ENERGY SECURITY

Objectives and Challenges:

The entire population (including vulnerable populations) has access to energy sources; Resilient, effective and reliable energy and food systems; Optimize resource use.

Strategy Examples:

- 1) Use of vacant lots for urban and peri-urban agriculture (i.e., in Alto Olimpo, Alto de la Ollería, Alto de Latimer, Alto de la Iglesia, Alto de Ubarri, Puerta de Tierra Norte, Venezuela / Monterey / Buen Consejo / S. Agustin);
- 2) Introduce public policies to demolish abandoned and vacant buildings and restore the river (50% completed by 2050);
- 3) Relocate food deposits away from the coast;
- 4) Green roofs (20% coverage by 2050) and vertical gardens to diversify food sources;
- 5) Common spaces designed to share and cook food together to increase social cohesion among residents;
- 6) Create a decentralized network of food deposits using existing infrastructure, i.e., schools or churches.



HABITABLE AND FAIR CITY

Objectives and Challenges:

Equitable access to social, cultural, technological, natural-ecosystem services and information; Promote a culture of participation.

Strategy Examples:

- 1) Decentralized resource and renewable energy management systems;
- 2) Pedestrian city;
- 3) Economy based on self-sufficiency by 2050;
- 4) Education focused on developing critical thinking, participation and collective action;
- 5) Create a culture of participation;
- 6) Paradigm shift from individualism to collective thinking.

Transformative Scenarios

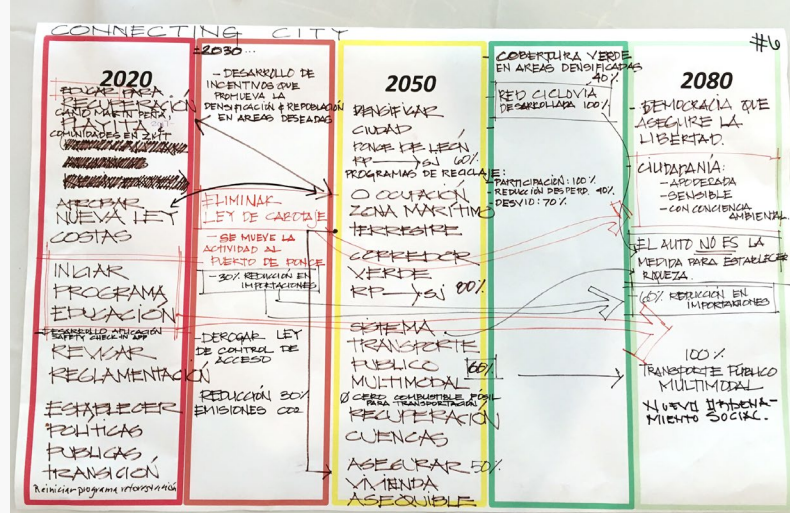
CONNECTED CITY

Objectives and Challenges:

Connectivity of the transportation infrastructure, integrating the character of the city; i.e., making the rivers or lakes part of the transportation system; Social connectivity.

Strategy Examples:

- 1) By 2080 there will be a multimodal public transportation system;
- 2) Watershed restoration;
- 3) Incentives to increase population density in suitable areas (i.e., by 2050, there will be 60% increase in the density of Ponce de León);
- 4) Educational programs to revitalize the communities of Caño Martín Peña and Playita;
- 5) Incentives for local production;
- 6) By 2020, there will be new legislation for coastal areas;
- 7) Ensure that 50% of housing is public (or affordable);
- 8) Develop waste collection and recycling programs, i.e. By 2050, there will be 100% involvement in recycling; 40% waste reduction and 70% waste separation.



"The organization of the workshop was excellent, and the topics discussed and the project as a whole are vital for the cities' awareness, study and improvement."

- Cesar Vissepó Vazquez

FLOODS (URBAN, COASTAL AND RIVER)

Objectives and Challenges:

Maintain the habitability and functionality of the city, even in times of high precipitation; The entire population has access to solutions, regardless of their socioeconomic level;

Strategy Examples:

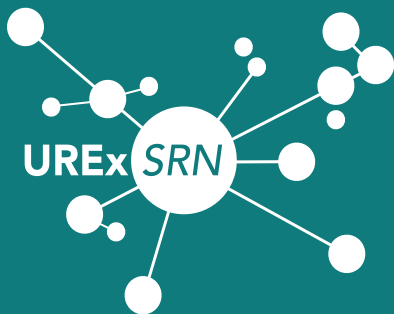
- 1) Expand the green footprint along the rivers and throughout the city;
- 2) Relocate populations outside flood areas; ■ 3) Water collection points that serve as social meeting places; ■ 4) Increase transportation connectivity; ■ 5) Community education and decision-making;
- 6) Creative design solutions; ■ 7) Update regulation codes; ■ 8) Use of absorbent materials.

Thanks to the collaboration of the College of Architects and Landscape Architects of Puerto Rico (CAAP PR), architects and designers working or living in San Juan who contributed to the workshop by generating adaptive scenarios to manage floods, and helping the other groups conceptualize the scenarios by providing drawings and sketches.



Participating Institutions & Organizations

- Programa del Estuario de la Bahía de San Juan
- Departamento de Recursos Naturales y Ambientales
- Escuela Graduada de Planificación, UPR - Río Piedras
- Instituto Internacional de Dasonomía Tropical, Servicio Forestal de E.E.U.U.
- Colegio de Arquitectos y Arquitectos Paisajistas
- 100 Resilient Cities, Rockefeller Foundation
- Proyecto ENLACE del Caño Martín Peña
- Autoridad para el Financiamiento de Infraestructura
- Federal Emergency Management Agency
- Urban Waters Federal Partnership
- Administración de Terrenos
- Municipio de San Juan
- Junta de Planificación
- Para la Naturaleza
- Estudios Técnicos
- Scuba Dogs
- Centro Sor Isolina Ferré
- Green Building Council
- La Maraña



About UREx SRN

Our mission is to connect scientists and practitioners to create resilient infrastructure with information, models, images, maps, histories, and projects from 10 cities, accelerating the production of knowledge and the implementation of innovative and sustainable solutions in urban ecosystems.

CONTACT:

Pablo Méndez-Lázaro
pablo.mendez1@upr.edu

Jennifer Santos Hernández
jennifer.santos1@upr.edu

Tisha A. Muñoz-Erickson
tamunozerrickson@fs.fed.us

www.URExSRN.net

[@urexsrn](https://twitter.com/urexsrn)

urexsrn@asu.edu