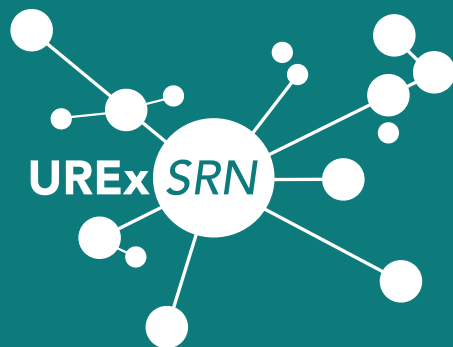




The UREx Guide to Scenarios



Urban Resilience to Extreme
Events Sustainability Research
Network

www.URExSRN.net

Participatory Scenario Workshops

In the face of climate uncertainty, scenarios allow us to explore possible futures, the key assumptions they depend upon, and the courses of action that could bring them about.

Overview

This *Scenario Planning Guide* outlines how the Urban Resilience to Extremes Sustainability Research Network (UREx SRN) supports ongoing efforts in its nine network cities in conducting participatory workshops. The Scenarios Working Group team, together with students, researchers, and collaborators across the network, have synthesized the co-produced visions from Workshop I. City-leads, practitioners, network participants, and participating institutions are encouraged to use the quantitative and qualitative outputs to further develop resilient, equitable, and sustainable transition pathways to help bring about their envisioned futures.

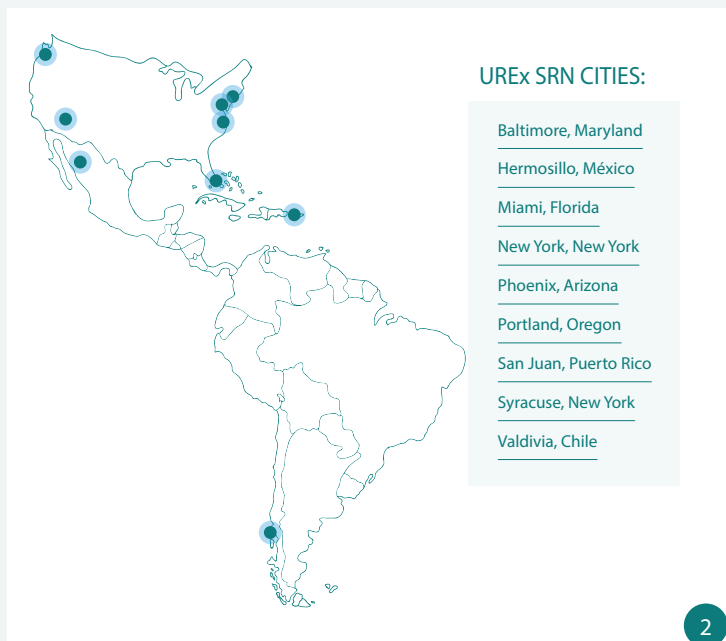
The primer begins with a brief description of the UREx SRN, before introducing the innovative framework applied to participatory scenario workshops. This is followed by an outline of the social-ecological-technological systems (SETS) approach that is applied throughout the project. A general explanation of scenarios is given, and a detailed description is provided of why scenario planning is applied, and the types of scenarios produced. The main portion of the primer focuses on the scenario workshops with detailed information provided on pre-workshop events, workshop activities and post-workshop data analysis and product synthesis.

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

The Urban Resilience to Extremes Sustainability Research Network (UREx SRN) is a multi-city project sponsored by the National Science Foundation (NSF). Initiated in 2015, the goal of the UREx SRN project is to enhance the urban resilience of coupled social, ecological, and built infrastructure systems in the face of rising challenges to cities from global climate change. The UREx SRN includes nine cities from Latin America and the United States impacted by coastal storms, flooding, drought, and heat waves. The network brings together a rich array of researchers from universities, as well as a variety of city-level practitioners, members of civil society and residents.

Through participatory scenario development and workshops, we have produced quantitative and qualitative outputs to visualize the futures (current state to 2080) of the network cities. We now need to ask what transition pathways can be envisioned that will allow cities to transform toward sustainable futures. To help answer this, we have developed an innovative framework that will:

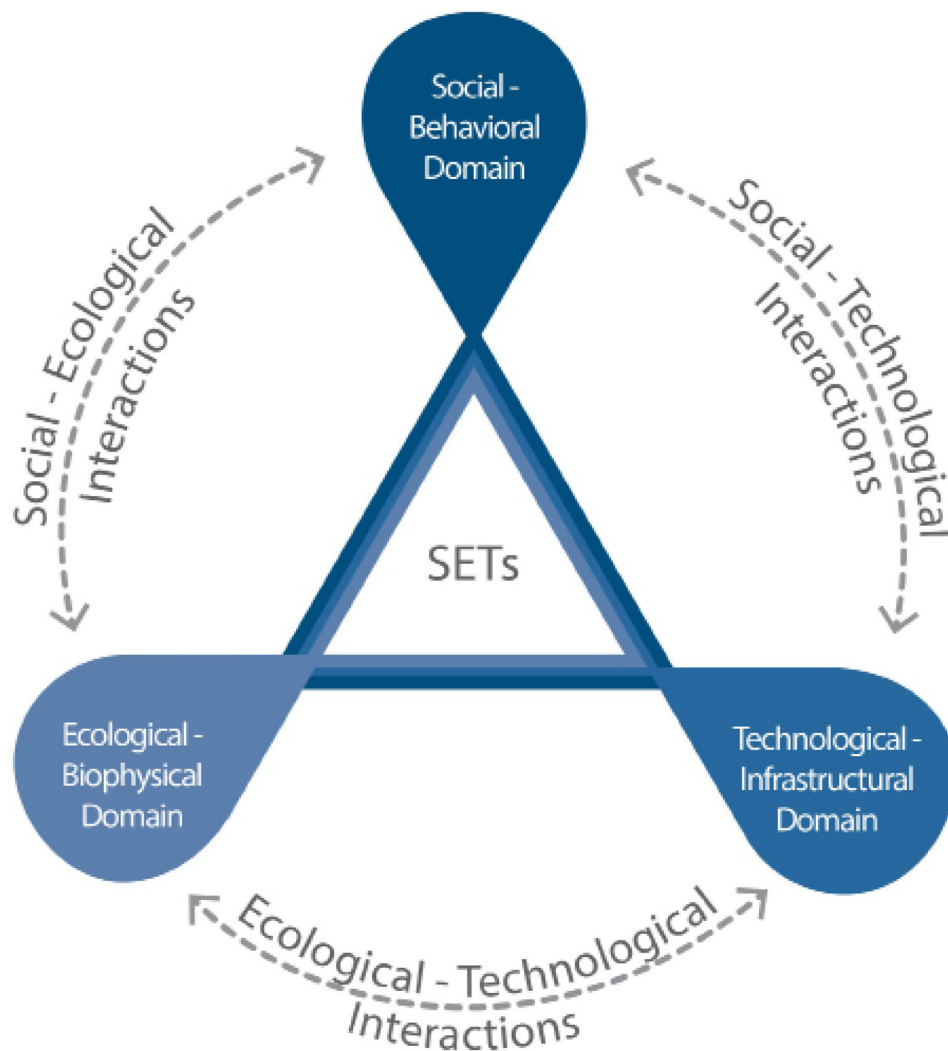
1. Compare urban conditions, focusing on contrasts among (and between) U.S. and Latin American cities.
2. Use inter- and transdisciplinary approaches from scenario analysis, climate, and hydrologic modeling, knowledge systems analysis, infrastructure analysis, and ecosystem service modeling to explore possible future conditions.
3. Co-develop (collaboratively with community, private-sector, and government partners) viable alternative pathways to achieve desired, plausible, and sustainable futures that enhance resilience to extreme events.



Social-Ecological-Technological Systems (SETS)

Many of the problems we face today, such as climate change, social inequality, and environmental degradation and biodiversity loss, cannot be solved by traditional planning approaches. These are complex problems 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 is how to foster resilience to extreme external forces such as those posed by climate change endangering 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 toward more sustainable futures.

Metropolitan areas, and the cities within them, represent complex SETS, as do the distinct neighborhoods, parks, and infrastructures of each city. 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 among the three dimensions.



What is a scenario?

A scenario is a plausible and coherent narrative about the future of a place or situation to produce anticipatory knowledge. Scenarios are plausible in the sense that a future scenario emerges from historic and present-day conditions. Scenarios are coherent in the sense that they reflect causal relationships between system variables that can be tested and that are internally consistent.

However, within these constraints, there is an invitation to think creatively and to push the limits of what we often think is possible, desirable, or inevitable. Scenario development has taken both forecasting approaches—looking to the future based on past, existing, and anticipated conditions—and backcasting approaches, which start from a desired future condition and determine what it would take to achieve the end goal.

Why scenario planning?

- Scenarios make explicit the assumptions that different actors may have about the way things work.
- Scenarios are particularly good at helping participants articulate their values, visions, and ideas about change.
- Scenarios point to gaps in understanding, data needs, and they can integrate diverse forms of knowledge.
- Scenarios can be used to explore the impact of alternative policy choices into the future in such a way that practitioners can assess, evaluate, and contrast the relative benefits and impacts of different policies.
- Scenarios help to anticipate and deal with uncertainty and shocks.
- Scenarios bring people together around a cohesive vision of the future.



Types of UREx scenarios

Adaptive scenarios are co-produced to explore strategies in response to extreme events using mixed forecasting and backcasting approaches. UREx SRN adaptive scenarios deal with drought, heat, and different types of flooding.

Transformative scenarios are co-produced to explore normative futures based on achieving sustainability and resilience goals. These scenarios present radically transformed futures and they are developed using a backcasting approach.

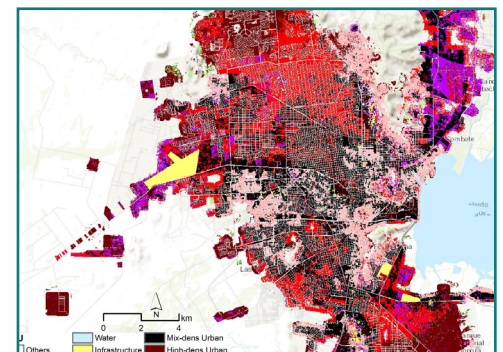
Strategic scenarios are built based on the goals and strategies from municipal planning documents. The strategic scenario can be considered a baseline against which to compare the co-produced adaptive and transformative scenarios.



Drawing of a cooling station in Phoenix by Patricia Ronczy



Illustration of an "Innovative Valdivia 2080" by Maria Maurer



Strategic scenario of Hermosillo, Mexico in 2080 by Ahmed Mustafa

Workshop I Overview

The UREx SRN scenario workshops seek to co-produce knowledge, and is participatory, in that we purposely consider contrasting perspectives and knowledge by bringing a diversity of stakeholders to the table. Typically, the initial scenario workshop convenes practitioners, administrators, decision-makers, civic and community organization leaders, designers, and researchers. Together, participants develop adaptive scenarios to address future extreme events and transformative scenarios that aspire to radically change the city/neighborhood/regional infrastructure and ability to respond to extreme events (see page 4).

In each workshop, participants work in small groups to jointly develop several overarching visions for the future of their city by 2080. Each small group is allocated predetermined scenario themes pertaining to sustainability and resilience to climate change and extreme events (such as flooding, extreme heat, concurrent multiple hazards, environmental justice, health, equity, smart technology, participatory governance etc.). These themes are identified through deliberation with the city's practitioner-researcher team and stakeholders (see the "Activities to Identify Scenario Themes" section for examples). Across the network, scenario themes and the spatial scale at which they are accessed are developed and selected in response to practitioner and community concerns, and in line with the cities' or counties' sustainability, environmental management, and climate action plans. Through various activities, the participants define goals, strategies, and targets for each scenario.

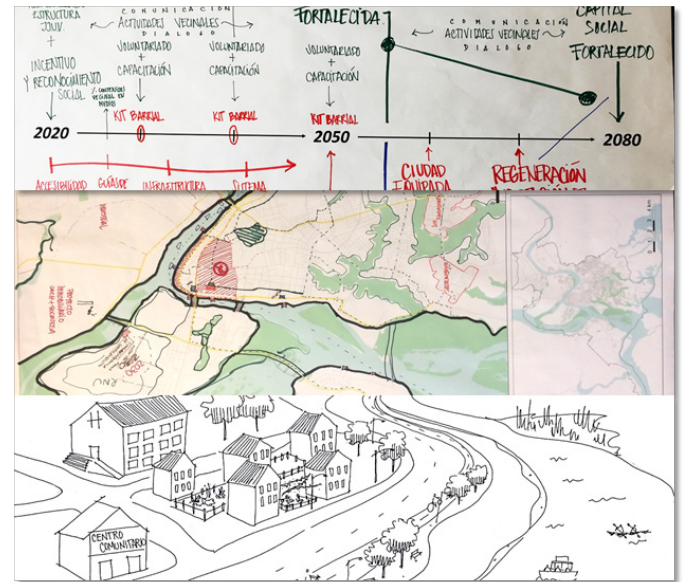


At the end of the workshop the participants present their visions and scenario pathways for their city in 2080 with narratives and visual illustrations. The future scenarios that were co-produced include a mixture of adaptive and transformative visions for more resilient cities by 2080. Examples include "Urban Heat Stress" (Baltimore), "Affordable Housing and Energy Democracy" (New York City), "Habitable, Livable, and Fair City / Ciudad Habitable y Justa" (San Juan), "The Right Kind of Green" (Phoenix), and "Eco-Wetland City / Ciudad Eco-Humedal" (Valdivia, Chile).



Workshop I Overview

After Workshop I, the UREx SRN team synthesized the visions defined in the workshop and developed quantitative and qualitative outputs to visualize the futures of the various network cities in 2080. The synthetic outputs include land use and land cover change (LULCC) maps and models to explore and evaluate outcomes of different strategies and visions, qualitative assessments of resilience, equity, sustainability and the potential for transformative change and visualization, and communication toolkits that cities can use to transition to the co-produced futures. The visions are meant to inspire and promote future sustainability and resilience in the cities and to serve as a platform for further collaborations and future resilience planning.



ACTIVITIES TO IDENTIFY SCENARIO THEMES

WORLD CAFÉ | semi-structured conversational process for knowledge sharing and large-group dialogue.

In Miami, Phoenix, and Syracuse, invited guests explored several topics related to enhancing urban resilience to extreme events in their cities. Multiple tables, or workspaces, with information on concepts ranging from eco-cities to diverse neighborhoods to zero waste, were set up across the room to emulate a café setting. At the start of the event, the host introduced the World Café process, provided a brief description of each of the concepts, and pointed out where they were in the room. The event proceeded with small groups (4–5 people) delving into a theme for short (15–20 minutes) rounds. Designated experts at each table answered questions and stimulated conversation with prompts related to the specific context and designated purpose of the event (namely, to narrow down the relevant themes and select those most pertinent to explore in a workshop setting). At the end of each round, guests moved to different topics and the host welcomed a new group, again outlining the theme and filling the group in on what transpired in the previous round. After several rounds, participants were asked to share insights and to rank the themes in order of importance or relevance to be explored in more depth in the scenario workshops.

RESILIENT INFRASTRUCTURE PLANNING EXERCISE (RIPE) | an effort to better understand climate risks and to build resilience in Portland, Oregon.

In 2017 the City of Portland began to explore the challenge of extreme events through RIPE to better understand the risks posed by major natural disasters to the city's infrastructure, and to identify near- and long-term steps to build resilience across systems. One of the main insights of the exercise was that Portland's current governance structures and arrangements posed a key barrier to infrastructure resilience. This led to the creation of the multi-bureau Disaster Resilience and Recovery Action Group (DRRAG) in 2018, a group tasked with developing governance frameworks for resilience and recovery. In 2019, DRRAG partnered with UREx SRN to support urban planning and development. Key outcomes of the partnership include the exploration of options for governance structures for resilience, the development of a resilient infrastructure investment plan, and a resilience and recovery plan. Through this participatory and anticipatory process, co-developed future scenario themes addressed environmental hazards, including extreme heat, urban flooding, earthquake, as well as multiple hazards occurring at the same time.



Scenario Workshop Process

Pre-workshop

1

IDENTIFYING SCENARIO THEMES

The scenario themes were determined through:

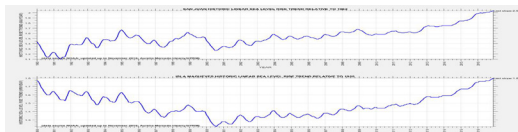
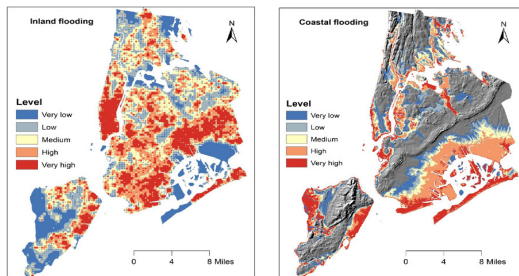
- semi-structured knowledge sharing events, e.g., World Cafés, or
- dialogues with city teams and stakeholders.

2

SCOPING AND FRAMING OF SCENARIOS

Scenario settings were based on:

- historic trends and current vulnerability to extremes,
- input from key actors in climate resilience and their perceptions,
- future climate projections, and
- existing strategies to address future extremes.



Workshop

3

SCENARIO GOALS AND OBJECTIVES

Overarching goals that the scenario seeks to address are co-developed in workshop.

4

STRATEGIES AND TARGETS

Specific strategies to accomplish goals are based on:

- existing strategies from planning documents,
- expert knowledge, and
- results from the governance survey.

5

SPECIFICITY

The scenario vision and transition pathways are described and include:

- temporal, spatial, and governance specificity.

6

NARRATIVES

Actor-orientated, place-based narratives about the future are created.

Post-workshop

7

QUANTITATIVE DATA ANALYSIS

Visual data generated by the modeling team includes:

- land use land cover change models to explore and evaluate outcomes of co-developed strategies and visions, and
- *Business-as-usual* (BAU) projections which extrapolate current trends.

8

QUALITATIVE DATA ANALYSIS

Qualitative assessments of *resilience, equity, and sustainability* evaluate:

- the potential for transformative change,
- cross-scale mismatches, and
- policy implications.

9

EVALUATING AND REFINING

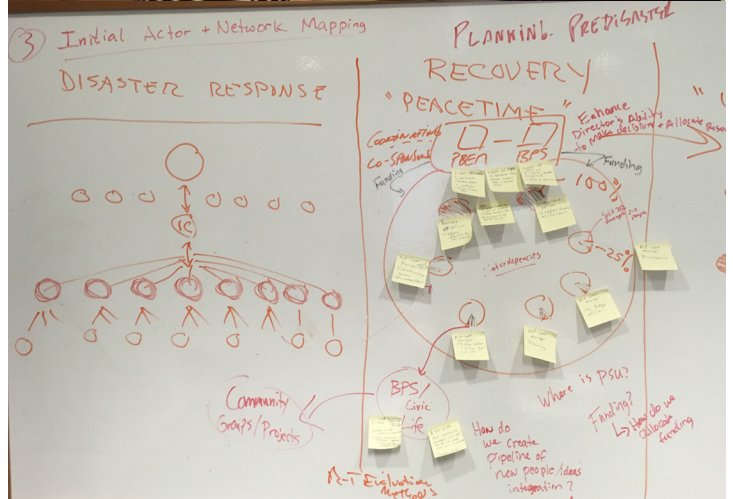
Debriefings and follow-ups lead to:

- inclusive perspectives, reflections, and insights,
- clarifying and revision of scenarios with new ambitions, overlooked values, and novel desires, or any other considerations.

Workshop II Overview

While the first workshop focuses on co-producing the scenarios, the second workshop or follow-up event focuses on collectively reviewing the synthesized outputs, revising the models, and bringing additional details to the scenario visions. Again, the overarching objective of this activity is to serve as a platform for ideas from different sectors and organizations leading the efforts to promote sustainability and resilience in the UREx SRN cities. In each city, however, the outputs from Workshop I, as well as the local context, capacities, resources, and needs must be considered when designing the follow-up event. Generally, the workflow is designed around four basic elements:

1. Objectives of the city team
 - linked to current city/regional needs and interests,
 - or to any ongoing local programs and initiatives
2. Capacity of the city team
 - including time and resources available,
 - and the potential to coincide with another event or to be held virtually
3. Current stage of product synthesis
 - if needed, the models, qualitative assessments or the visualization and communication tools need to be complete
4. Desired outcomes
 - workshop objectives and envisioned outputs must be driven by city/regional needs and capacity



Workshop II

DESIGN

Several follow-up workshops have occurred and in each case have taken on slightly different forms. In San Juan, Puerto Rico, the aim was to collectively revise initial scenarios, identify trade-offs and synergies, and to discuss the extent to which the proposed strategies needed to be refined after having experienced an extreme hurricane event. In South Mountain Village, in collaboration with the Central Arizona-Phoenix Long-Term Ecological Research (CAP LTER), strategies were revised with the aim of developing a master sustainability or resilience plan. While in Baltimore, by partnering with the Urban Waters Partnership, a list of high-priority strategies was generated to help build resilience in the Central Maryland region through bottom-up implementation projects. In Portland, detailed governance frameworks were created, informed by transformative resilience futures and pathways

developed in the initial workshop, that were further developed, stress-tested, and iterated upon. The city of Valdivia in Chile attempted to create a single, unifying vision to be incorporated into their municipal planning goals, with an overarching objective of contributing to the city's climate action plan. The general aim of the second workshop in Hermosillo, Mexico was to develop implementable strategies by grouping interdependent and interlinked strategies and to develop and assign working groups (mesas de trabajo) to further the co-produced visions.

Generally, the overarching aim of the follow-up workshop is to refine and revise the scenarios with any new ambitions, values, and desires, or any other considerations overlooked since the initial workshop.



Workshop II

LOGISTICS

In this section we outline the key considerations that need to be considered when designing Workshop II or follow-up events.

Participants:

Consider participants previously involved in Workshop I and any new stakeholders pertinent to the process of further exploring the co-developed scenarios and the goals specific to the city. As before, a heterogeneous group brings more points of view, which leads to a more nuanced, richer understanding of a situation.

Important considerations:

When to host the workshop: Similar to the first workshop, this will depend on your target participants. A scenario planning workshop typically takes up a full day (up to 8 hours). Workshops held during regular business hours will be successful at bringing professionals for whom attending the workshop is part of their job description, but it may exclude residents who need to go to their regular jobs. Take note of local events (e.g., holidays, municipal elections, cultural festivals).

Venue: Preferably, use the same venue as before. If this is not possible, select a neutral place in the community or nearby. Take into account the size and configuration of the space, the community's perception of the venue and its accessibility. The space should be suitable for both large plenary discussions and small group work. Consider the acoustics of the place, the possibility of projecting images, and how many small working group areas it can accommodate. Given that workshops are long, it is best if you plan on providing food and refreshments for participants. Hence choose a venue that has a kitchen or that can accommodate catering. Also ensure the venue is accessible for most participants by public transportation and if not, consider offering to cover the costs of transit or parking.

Size of workshop: UREx SRN workshops typically include plenary activities as well as small group work. If this is likely to be the case in the second workshop, we suggest between 5 to 7 participants per scenario theme. In addition, we propose a facilitator and a note-taker at the table. UREx SRN workshops typically range between 30 to 60 participants.



Workshop II Activities

This section describes activities that have been carried out in UREx SRN Scenario Workshop II or follow-up events. The activities need to be adapted to the local context, resources, needs, and objectives.

SCENARIO REVIEW | activity to collectively revise and refine initial scenarios

After a synopsis of the scenario process, the scenario needs to be updated with new information and any changes that have occurred. Using material outputs from Workshop I (posters stating the main goals and objectives and some example strategies, digitized co-produced timelines, participatory land use and land cover change maps, narratives, vignettes, or renderings), small groups reflect and review through discussion and clarification. The emphasis is on reminding participants of any important aspects, places, and events that made up their envisioned scenarios and noting how these might have evolved and why. The activity also updates any new participants on the particular scenario theme and its vision or to apprise those who are new to the process entirely. The group then annotates the products with any observations, key likes/dislikes, interesting features, feelings, unspoken thoughts, assumptions, relationships, metaphors, etc. to further discuss and reflect upon the desired future.



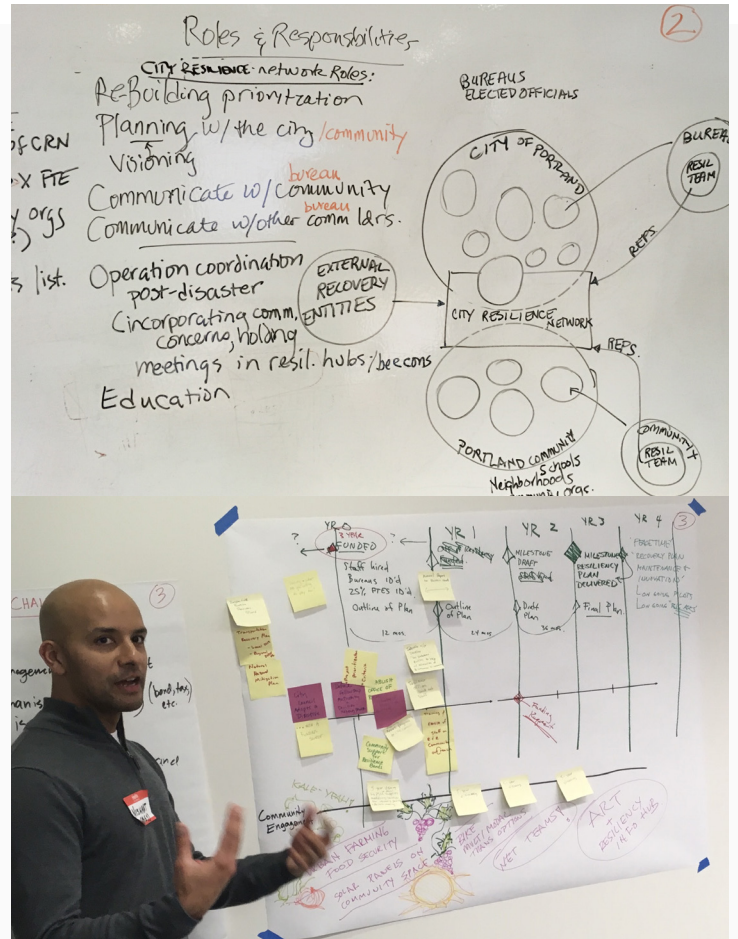
GALLERY WALK | discussion technique to actively engage participants across the entire workshop

In small groups, participants share ideas and respond to revised Workshop I outputs (timelines, participatory maps, scenario key goals and objectives, narratives, and renderings) co-developed by the other scenario groups. The facilitator answers questions and explains how the outputs have been synthesized and revised. Participants are asked to consider how the scenario overlaps or conflicts with their own scenario visions and strategies, and to incorporate aspects of resilience, sustainability, equity, and the intersection of social-ecological-technological transitions and transformations. Participants annotate the outputs with sticky notes, commenting with what they value and what they object to about the scenario: "So exciting!"; "Come on, can't we do better..."; "Impossible".

Workshop II Activities

GOVERNANCE PATHWAYS | activity to analyze the actors and institutions involved in achieving desired resilient outcomes

Based on the co-developed visions from Workshop I, participants collectively sketch governance goals and a governance framework aimed at realizing the vision. Prompted by the question, "How *should* we get there?" the group identifies roles, responsibilities, and new organizational forms needed to achieve the goals of the vision fairly and effectively. The activity is supported by cards offering transformative governance suggestions and innovative ways to approach the challenge, centering the conversation around principles identified in the literature. In particular, the group jointly develops governance priorities and milestones to achieve the vision. Specificity is added by delving into potential barriers and opportunities across the network, before drafting an organizational framework with key structures and functions identified. To implement the governance structures, implementation pathways, for recovery and/or resilience, are mapped out that include the necessary steps, actions, and changes needed as well as the connections between actors and organizations. The emergent frameworks can also be 'exposed' to extreme events to test their durability.



Workshop II Activities

MULTI-CRITERIA ASSESSMENTS | tools to evaluate how strategies enhance resilience, equity, and sustainability of the visions

Based on an inventory of the strategies co-developed during the initial scenario workshop, a qualitative assessment of resilience, equity and sustainability is conducted. Firstly, several (2–5) defining characteristics or key components are identified for each scenario. Each of these defining features are then scored to assess how they contribute to resilience, equity, and sustainability in each of the scenarios. The extent to which the defining characteristic or key component contains mechanisms that enhance resilience is examined according to resilience principles identified in the literature (such as assessing how well the mechanisms foster diversity, increase redundancy or practice adaptive management). To assess the sustainability and equity of the key features, the proposed strategies are assessed using the Sustainable Development Goals (SDGs). The results of the assessment are visually depicted to illustrate how each scenario contributes to enhancing resilience, equity, and sustainability.



DISASTER CARDS | activity to stress-test scenarios using randomly assigned cards that stimulate disorder

Participants are randomly assigned “disaster cards” to consider features of resilience and how the scenarios withstand unexpected disturbances. The co-developed visions are subjected to large shocks to assess flexibility and the ability to adapt to uncertainty. A variety of locally-relevant disturbances ranging from energy, transportation, or communication disruptions, increases in sea level and temperatures, financial crisis, pandemic, mass emigration, to an influx of climate refugees can be randomly assigned as “disaster cards”. The scenario is subjected to large shocks in an unpredictable order, and participants need to collectively evaluate how the components depicted in the scenario cope. Participants are asked to consider which parts are more or less affected and what mechanisms and features ultimately contribute or hinder resilience of the scenarios.

Workshop II Outcomes

MESAS DE TRABAJO | thematic working groups continuing the development and implementation of co-produced visions

Through an iterative process of both virtual and in-person group discussions, joint research, and collective workshop design, city stakeholders from Hermosillo, San Juan, and Valdivia—together with research partners across the network—continue to engage in the scenario development process. Stakeholder knowledge and perceptions are strongly reflected in the themes and goals of the ultimate scenario visions. By forming thematic working groups, *Mesas de Trabajo*, they continue the development and implementation of co-developed visions into upcoming governance plans, forming new partnerships, sharing knowledge, and continued engagement.



Future Cities

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Future Cities is a monthly podcast that catalyzes action on urban resilience, discussing ongoing research, highlighting stories of resilience in cities across the world, and showing deep insights into perspectives, the show digs deep into the ways in which cities are coping with extreme weather events and the ways in which cities can start of every month. If you have questions or suggestions for future episodes, please contact futurecitiespodcast@gmail.com or @FutureCityPod.



SAPPHIRE NECKLACE

RESILIENT SHORELINE COMMUNITIES ALONG THE SAN JUAN BAY ESTUARY

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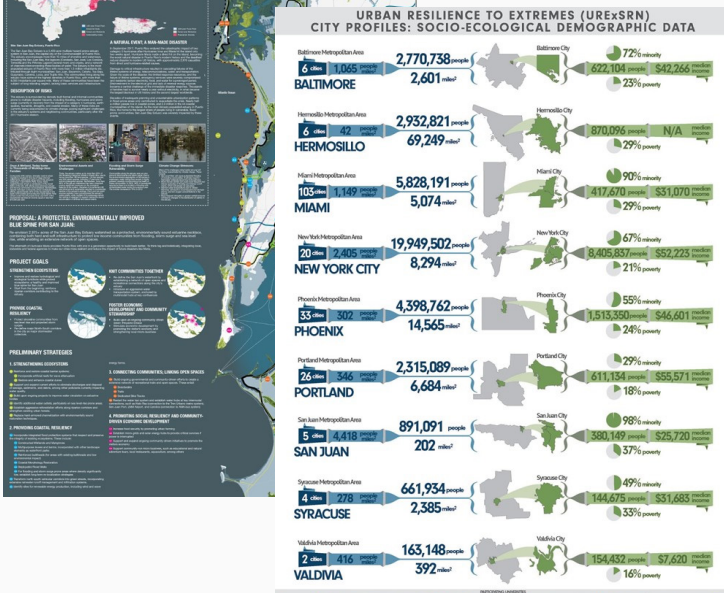
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TRANSITIONS TOOLKIT

guide to navigating future sustainability shifts

To further expand the knowledge base needed to support sustainability transitions in our network cities, the UREx SRN team is working on creating user-friendly visualization and communication tools. Based on the interests of practitioners and community participants, broad themes are being identified to help organize public dialogues and knowledge-sharing events. The team is synthesizing all the data produced before, during, and after the workshops into a tool format, including a comprehensive slide deck, one-pagers, fact sheets, and story maps. Together with working groups and ongoing conversations occurring across the network cities, the aim is to collectively produce proposals, action plans, policy briefs, and co-production manuals to further guide transitions under various scenario themes. Ultimately, the goal is to connect the know-how across the UREx SRN such that any individual or team interested in learning how to move forward with implementing a strategy or vision, can efficiently advance the learning process. This helps to overcome knowledge barriers, and connects network participants and their affiliates to others in the network working on academic research using data from governance surveys, policy documents, adaptive and transformative scenarios, social networks, etc., as well as those creating renderings and producing future models and maps, infographics, videos, and podcasts.





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Scenarios Working Group

The Scenarios Working Group comprises a core group of researchers working together with city teams to co-develop visions of resilient, equitable, and sustainable futures.

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