12-18-2018

Imaginingaclimate-changefuture,without thedystopia

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Recommended Citation

SCIENCE AND CULTURE

Imagining a climate-change future, without the dystopia

Gayathri Vaidyanathan, *Science Writer*

Most popular narratives about climate change are negative, playing off people's anxieties. In the movie *The Day After Tomorrow*, a climate disaster precipitates the fall of civilization. Margaret Atwood's novel *MaddAddam* is set in a society shattered by an ecological catastrophe. In Aaron Sorkin's HBO TV series *The Newsroom*, an Environmental Protection Agency researcher proclaims, "a person has already been born who will die due to catastrophic failure of the planet." The "cli-fi" genre is so popular that the Chicago Review of Books has an entire column ("Burning Worlds") dedicated to it.

But a group of scholars is trying to resist such negative thinking, even while grappling with serious consequences for both humans and ecosystems. People from government, academia, and nonprofits are joining community representatives as part of the Urban Resilience to Extremes (UREx) Sustainability Research Network to rethink how society envisions and plans for climate's effects in the decades to come

(1). At a 2017 workshop, issues ranging from flooding to droughts to social justice were on the agenda.

"It's difficult to know where you are going if you don't have a clear vision of what that [future] should look like, in particular, a positive vision that you could get excited about and motivated to really make a transformative change," says Timon McPhearson, director of the Urban Systems Lab at The New School in New York City. McPhearson and his colleagues at UREx are helping city planners assemble positive, and yet realistic, futures—without downplaying the dire implications of climate change. At the end of the workshops, they arrive at a set of implementable goals and timelines to achieve their strategy.

Maggie Messerschmidt, a participant in a UREx workshop and a program manager at The Nature Conservancy (TNC), says TNC polling suggests that people are much more likely to act when future scenarios are placed in a positive light, emphasizing terms such as "resilience," "sustainability," and "nature-based

A 3D visualization of Lower Manhattan and parts of Brooklyn, NY, showing coastal inundation from Hurricane Sandy, is part of an effort to explore which buildings and residents may be at risk from future storms. The Urban Systems Lab layers present-day data and future visions of cities, tracking social, ecological, and technological systems. Image credit: Urban Systems Lab.

At a scenario-development workshop in New York City's Harlem neighborhood, residents, local leaders, neighborhood organizations, and city agencies came together to develop alternative visions for resilience to extreme climate-driven events such as heatwaves and flooding. Image credit: Timon McPhearson (Urban Systems Lab, New York).

solutions" (2). "It is important for us to share a positive narrative," she says, "and that's been important to the way we think and construe our solutions."

This bottom-up thinking complements the aims of international initiatives such as the 2015 Paris Agreement, says Joost Vervoort, assistant professor in environmental governance at the Copernicus Institute of Sustainable Development in Utrecht, The Netherlands. Such agreements set clear targets—limit the temperature increase to well below 2 °C by 2100, for example—and reveal how far we are from such targets. But they don't reveal the granular details of what citizens and policymakers need to accomplish to realize that future—the where, when, and how of fulfilling that vision, says Vervoort. This is where "futures planning," building on more conventional urban planning, comes into play.

Long-Term Thinking
People struggle to grasp big timescales. So it's partly a reflection of the human condition that most city-level planning documents are shortsighted, reaching out just 5 or 10 years, with a few exceptions, such as regional plans that may have a 20-year time horizon, McPhearson says. Even the ambitious United Nations (UN) Sustainable Development Goals stretch only out to 2030.

A UREx workshop focuses on the long-term, out to 2080 or beyond, a time horizon that climate models usually work on. With climate change in mind, the initiative is meant to adapt and expand on urban planning strategies, accounting for synergies, trade-offs, and conflicts.

After choosing a city, the scientists send out surveys to various local professionals working in sustainability to understand their thinking on societal resilience to climate change. Participants analyze relevant plans (some

cities have 20 to 30 different ones) and examine current policies. They then create various "business as usual" scenarios out to 2080 that are based on present-day policy choices in existing plans.

"We are able to push the planning work and say, if we continue going on the trajectory set forth by these plans, what might the future look like," says David Iwaniec, a professor of urban studies at Georgia State University and UREx member. The model might incorporate flooding, heat, or population change. Next they start on their main task: a "visioning workshop" focused on transformative ideas.

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Stakeholders from government, community groups, and nonprofits sit at tables assigned to specific subjects—say, flood resilience or heat equity. Over the course of the next 8 hours, participants move from big-picture concepts to specific social, ecological, and technological strategies as they consider synergies, trade-offs, and conflicts among them. Then they figure out the sequence of actions necessary to implement a strategy. For example, in the case of a coastal retreat strategy, participants would identify where people can go and the steps necessary to revitalize the urban core, which may require governance changes.

These strategies include, for example, restoring wetlands for coastal flood protection in San Juan,

Puerto Rico, by 2050 or expanding green roofs and other infrastructure changes to improve resilience to heatwaves in Baltimore. In the process, participants identify factors that would either stall progress or facilitate their vision. Finally, they craft a narrative of what this 2080 future may look like, based on which a designer creates multiple drawings of the future city. Components of these conceptualizations are incorporated into the modeling. Scenarios may be mild or radical departures from the present.

In San Juan for example, city planners came up with a scenario that involves moving people off the coast to protect them from flooding, as well as building artificial reefs and mangroves, and using dams, water pumps, and other infrastructure to improve resilience. San Jan would be completely different. "I remember asking one of the planners that was sitting at the table, 'Why did you choose coastal retreat as a scenario?'" recalled Iwaniec. "She said, 'Because if I were to explore a scenario like this officially in my planning department, I'd be fired.'" Such managed retreat plans are fraught given the many interests involved; residents and resorts located on the coasts, for example, would stand to lose money and property.

The UREx team uses the vignettes as inputs for a computer model. "The whole idea is to build a relatively complex model of the city that can spatially project what the future city will look like under various assumptions about change," McPhearson says. Participants use models of 10-meter resolution that contain details about the city as it is now—its land use and land cover, demographic data, streets, buildings, and other infrastructure. The researchers then calibrate the model by training it on changes in the city landscape—land-use patterns and demographics for example—from recent decades.

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In the next step, modelers take the specific spatial configuration of the desired goals, for example, aspirations to create 10% more green space or increased building density in a particular neighborhood, as inputs to the model, which then forecast long-term future urban landscapes. "We can ask, 'how did this [target] work? What are the trade-offs?'" McPhearson says.

The results can be counterintuitive. In Phoenix, for example, Messerschmidt and other participants worked on resilience strategies for the drought and heat expected in 2080. They suggested aggressive water-conservation strategies, including injecting water underground and reducing usage. But their vision also included planting many trees. When McPhearson

input these strategies into the model, he found a contradiction: The water-conservation strategy meant that the planned trees would not have sufficient water. When McPhearson took this result back to the participants in a second workshop, they were surprised. To refine their strategies, contributors examined the 2080 outcome, decade by decade, working backward to the present day, to ensure a balance between their water management and green infrastructure goals.

Seeding the Future

Another initiative, called "Seeds of the Good Anthropocene," runs futures workshops with similar overarching goals but different techniques. Participants begin by identifying weak signals, or "seeds," in the present-day social, ecological, and technological domains that could grow into something transformative if tended carefully (3). "This is starting with the now and trying to play that out step by step until we get to the future," says Elena Bennett, an ecologist at McGill University.

Seeds are typically small, existing initiatives that can be scaled up and, in principle, result in transformative change. The idea is to figure out the institutional or political contexts that allow the transformations to flourish and become mainstream. Recent climate-related seeds include garden-enveloped skyscrapers in Singapore, bayous bordered with parklands to mitigate flooding in Houston, and a type of ocean aquaculture that uses the entire water column.

Seeds are meant to become more detailed plans. Tropical gardens around skyscrapers may result in a plan to increase urban green space. As with UREx, participants try to discern if any one seed will help or hinder other seed initiatives—and what the unintended consequences might be in a particular city. Might green infrastructure require significantly more water, for example? The answers would depend on variables such as location and the biome in question.

The strength of both approaches, say participants, is the process itself, which brings together a variety of experts and stakeholders in a safe space where they can ideate freely. "It's a way of getting people excited, getting them thinking about it, which is the first step in changing the dialogue and thinking about long-term sustainability, and not just thinking a year or 2 years ahead of us," Iwaniec says.

The work, though, could have real-world impacts in the near term. Sustainability officials in Phoenix, San Juan, and Miami are using the UREx visioning workshop outputs to inform planning for resilience to climate change when considering the trade-offs and synergies between and among policy choices. In Valdivia, Chile, the visioning exercise has helped convince city council members to discuss climate change and resilience. The seeds researchers, Bennett and Vervoort (often along with community and nonprofit representatives), are working with international policymakers, such as the UN Environment's Global Environment Outlook, to generate bottom-up scenarios that complement the top-down policymaking.

There is a critical need for positive visioning in the international policy space, says Luke Kemp, a lecturer in climate and environmental policy at the Australian National University. Until a few years ago, almost all economic models on climate change would frame climate policy as only a cost, while ignoring co-benefits of, for example, renewable energy expansion. Kemp believes this led to a negative view held by policymakers that taking climate action will inevitably hurt their gross domestic product. Even today, most countries do not include the benefits of cleaner air or green employment in their analyses of national climate goals, he says.

"The way you frame problems determines the way you analyze it and how the benefits and costs are considered," Iwaniec says. "It's not all bad. We can do something about it. It's empowering in many ways to think about a positive future, especially being inundated with all these negative, dystopian ones."

1 McPhearson T, et al. (2017) Positive visions for guiding urban transformations toward sustainable futures. *Curr Opin Environ Sustain* 22:33–40.
2 Weigel L, Metz D (2015) How to communicate successfully regarding nature-based solutions: Key lessons from research with American voters and elites. *The Nature Conservancy.* Available at https://www.conservationgateway.org/ConservationByGeography/ NorthAmerica/UnitedStates/Documents/TNC%20Nature-Based%20Solutions%20Communication%20Recommendations.pdf. Accessed October 18, 2018.
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