



NATURE-BASED SOLUTIONS FOR URBAN CLIMATE RESILIENCE

THE
NEW
SCHOOL

URBAN
SYSTEMS
LAB

@USL_NYC

URBANSYSTEMSLAB.COM

@TIMONMCPHEARSON

NBS FOR URBAN CLIMATE RESILIENCE:

- ▶ **Urbanization and Climate Change**
- ▶ **How Much Can NBS do?**
- ▶ **Putting NBS into an Urban Systems Context**
- ▶ **Bringing Science to Policy**
- ▶ **Sharing Knowledge - Building Networks**

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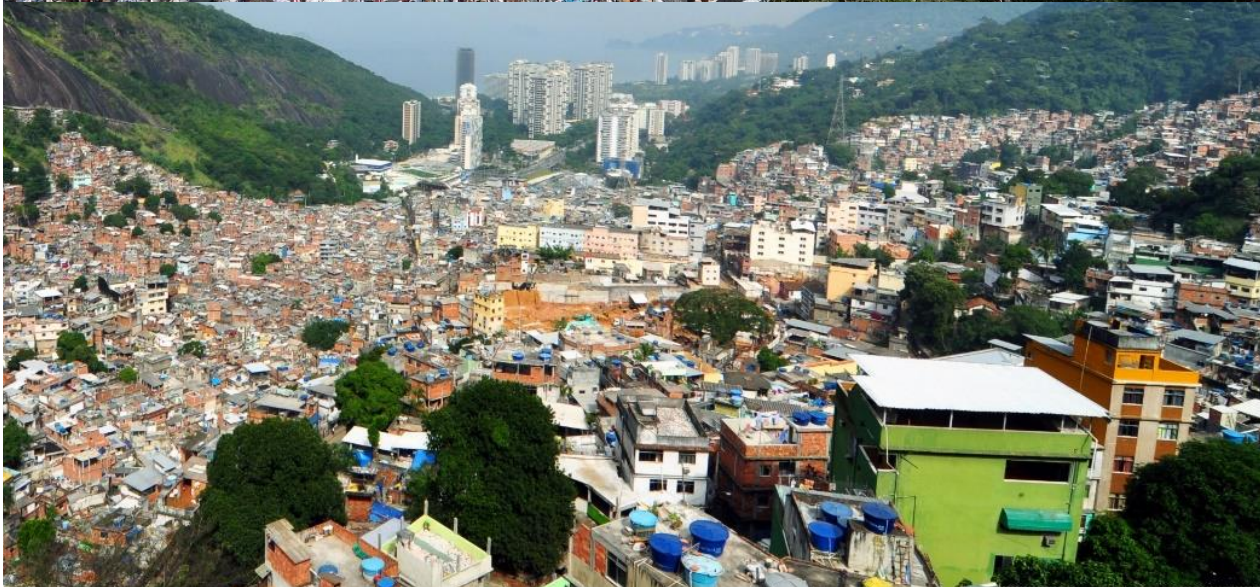
The background of the slide is a complex, layered illustration. At the center is a stylized Earth showing the continents of North and South America. Surrounding the globe is a circular band containing silhouettes of various elements: trees, people in different poses (some running, some standing), and animals like a horse and a deer. The entire scene is set against a background of numerous thin, white, radiating lines that create a sunburst or starburst effect. The color palette is primarily blue and white, with the text in black and white.

URBANIZATION AND CLIMATE CHANGE

ON A COLLISION COURSE

OUR SHARED URBAN PLANET

COMPLICATED, COMPLEX, CONNECTED, CONGESTED, & CONTESTED



URBAN PLANET

Knowledge Towards Sustainable Cities



EDITED BY

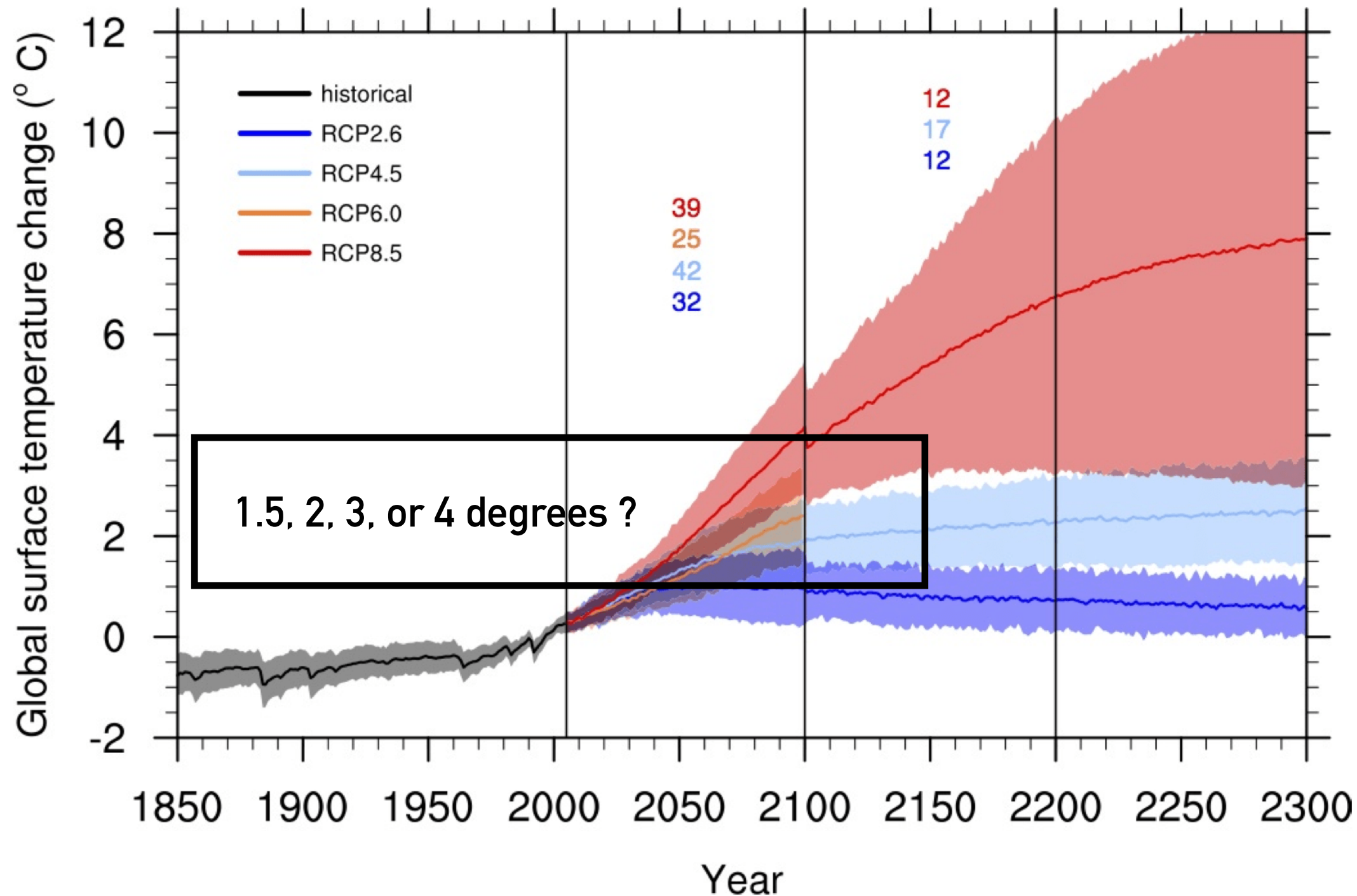
| | | |
|-------------------|---|------------------------|
| THOMAS ELMQVIST | • | XUEMEI BAI |
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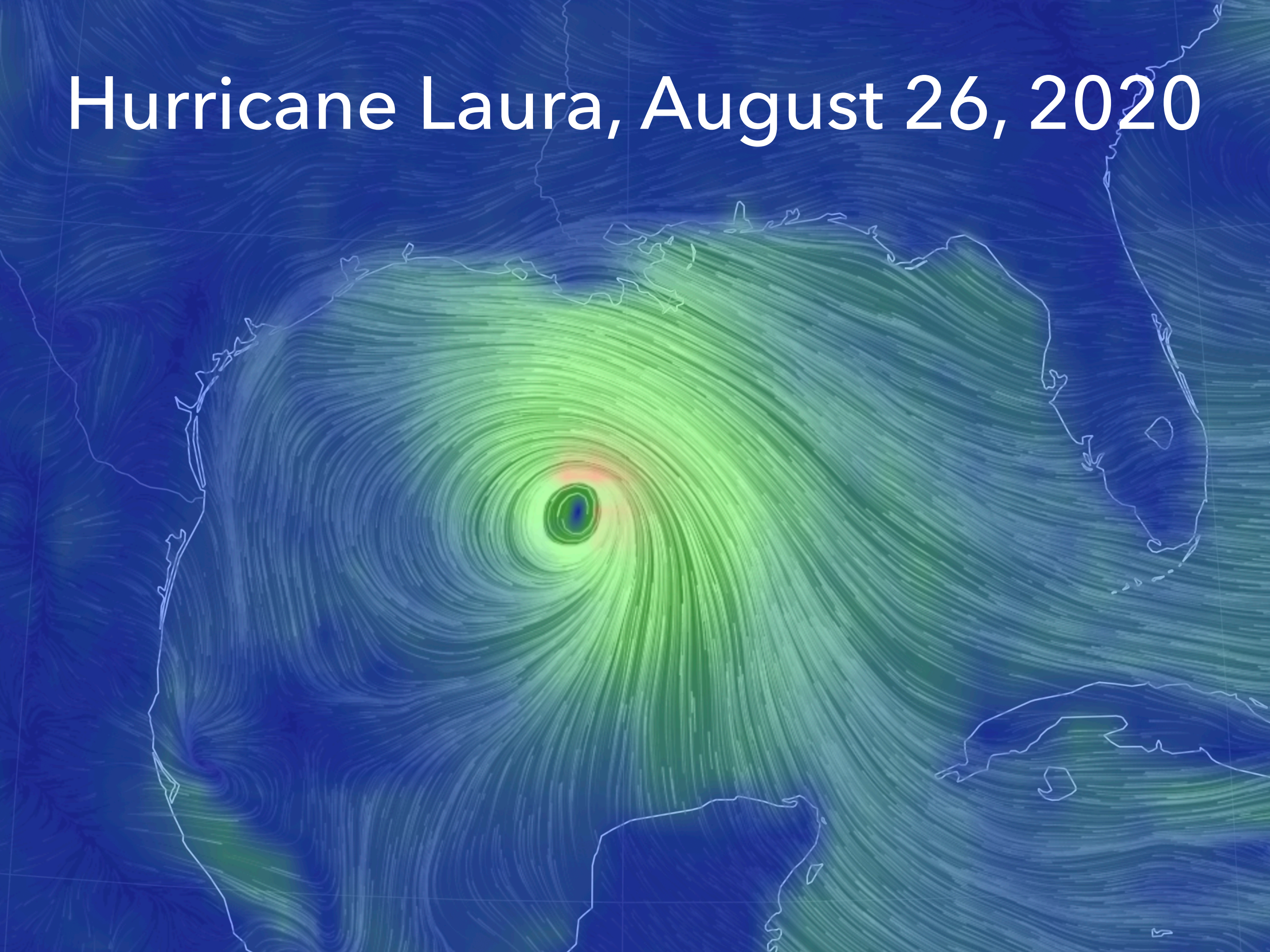
SCIENTISTS, ARTISTS, DESIGNERS, PLANNERS, ECONOMISTS, ACTIVISTS

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IPCC GLOBAL CLIMATE SCENARIOS (AR5)



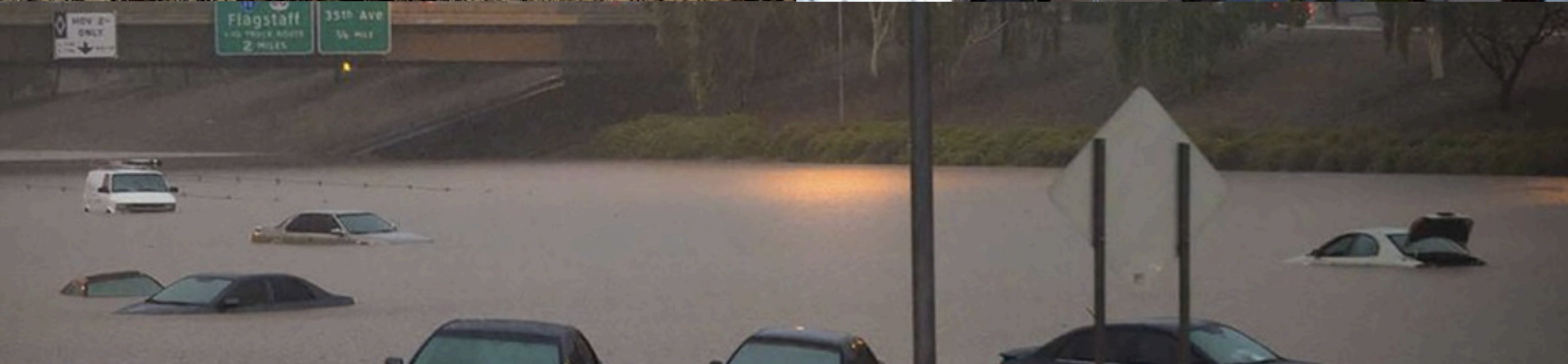
Hurricane Laura, August 26, 2020



Wildfires in California-Oregon- Washington September 2020



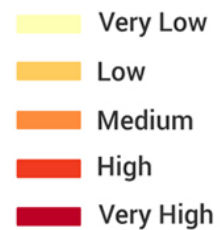
Urbanization and Climate Change on a Collision Course



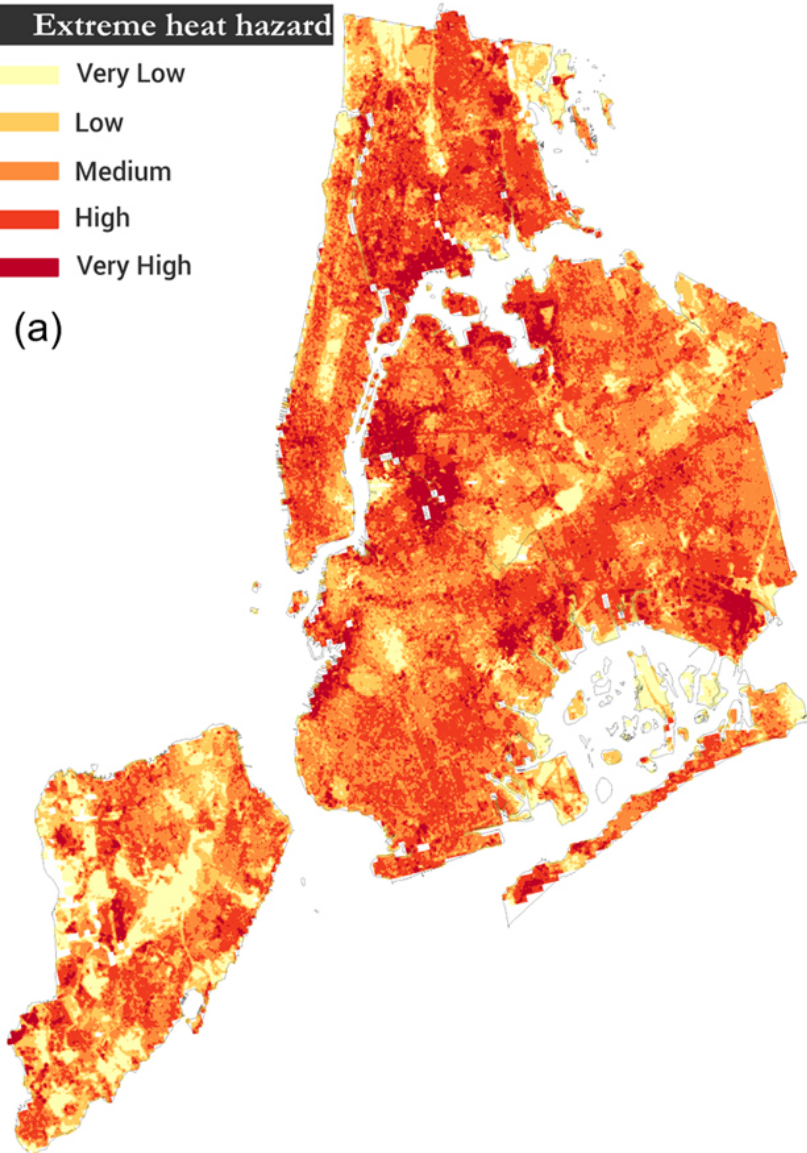
MULTI-HAZARD RISK IN NEW YORK CITY

Heat

Extreme heat hazard

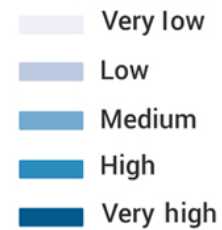


(a)

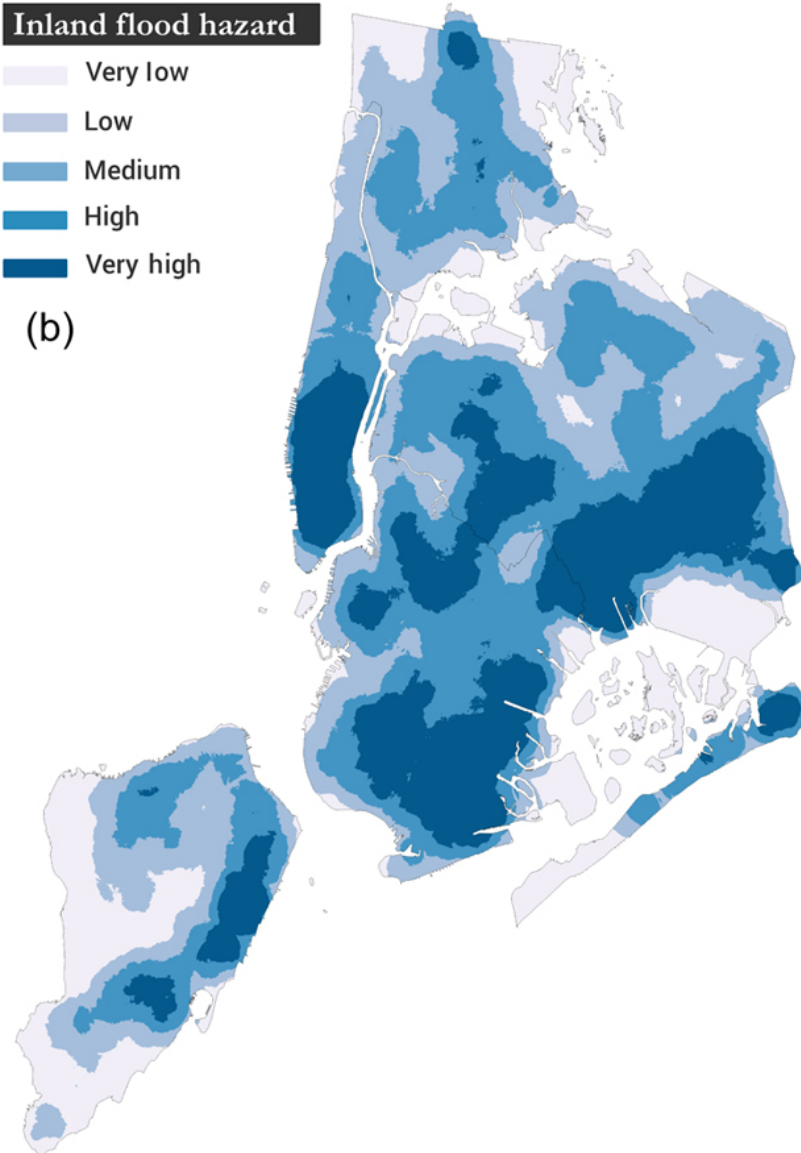


Inland Flooding

Inland flood hazard

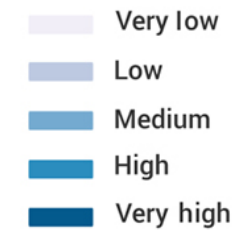


(b)

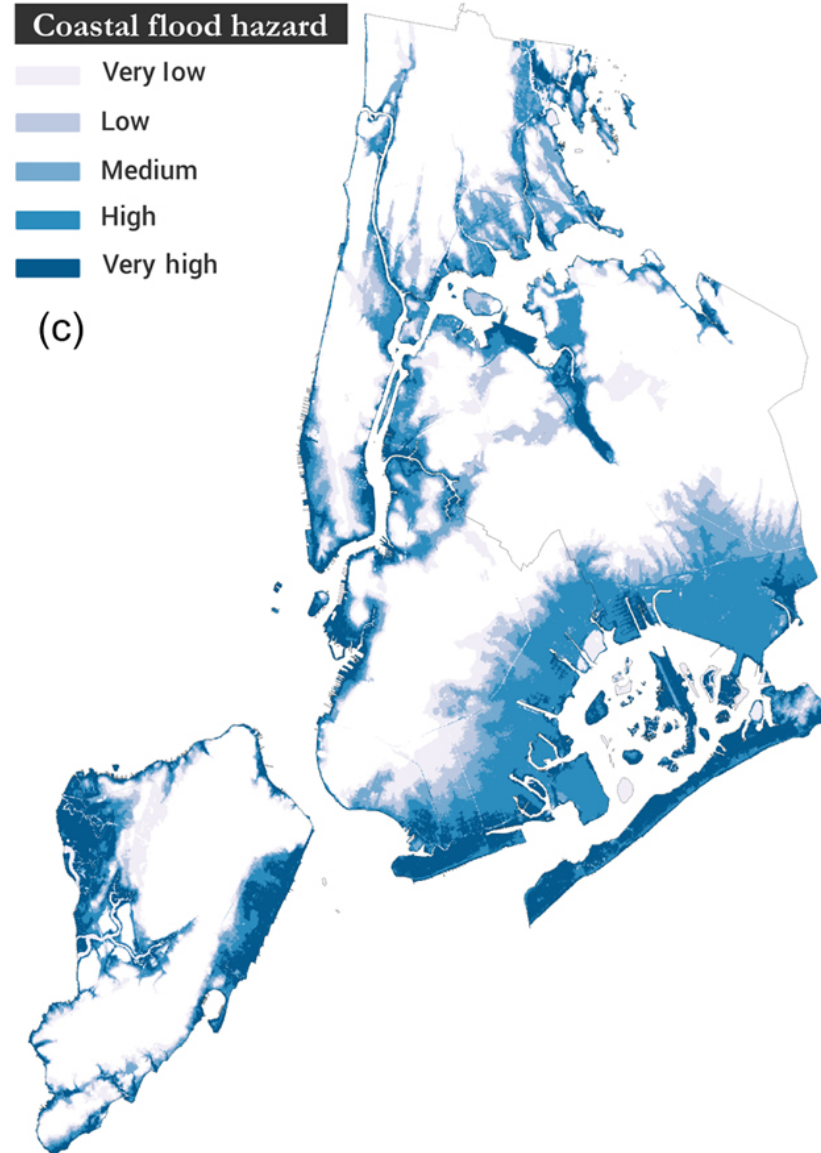


Coastal Flooding

Coastal flood hazard



(c)

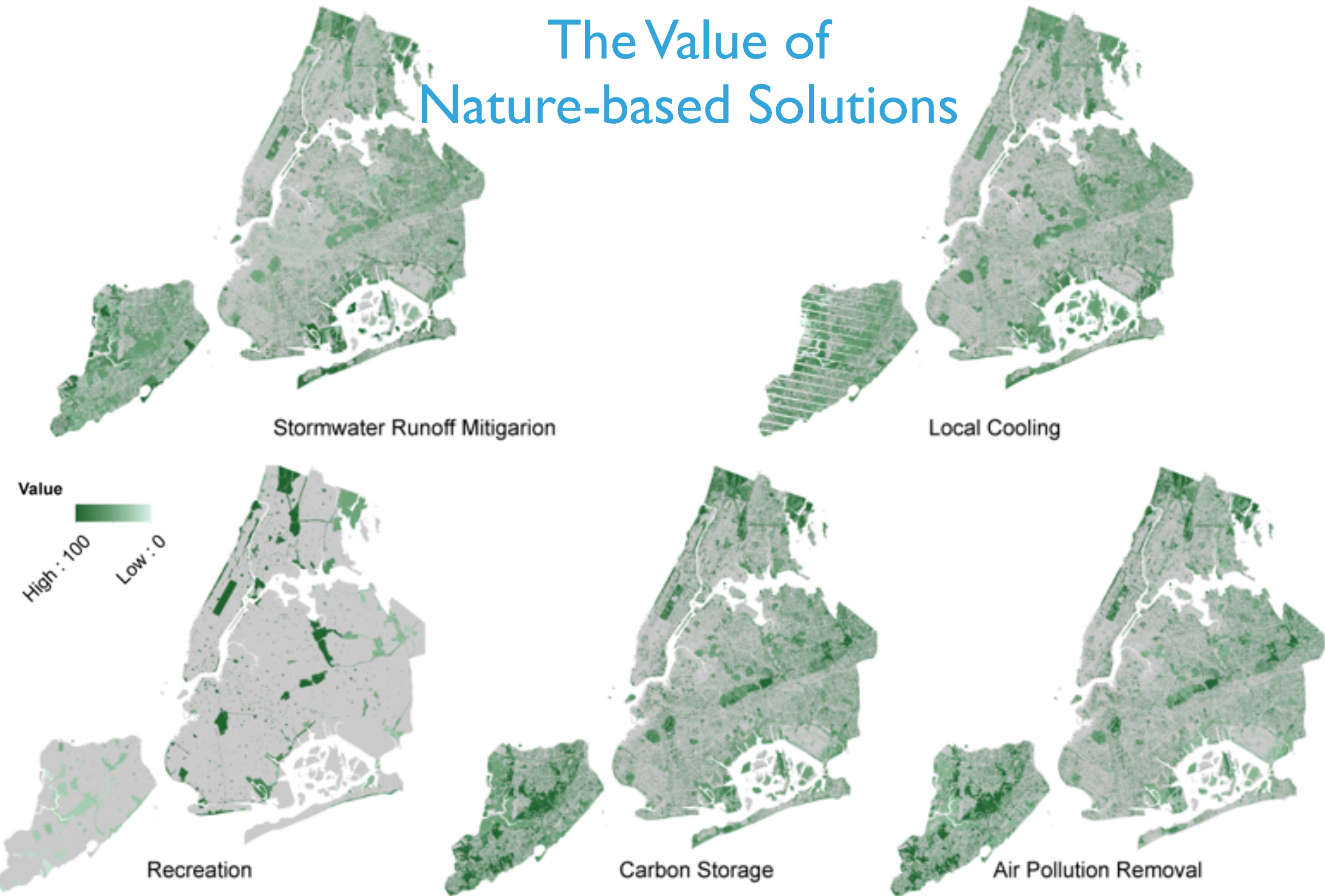




HOW MUCH CAN NBS DO?

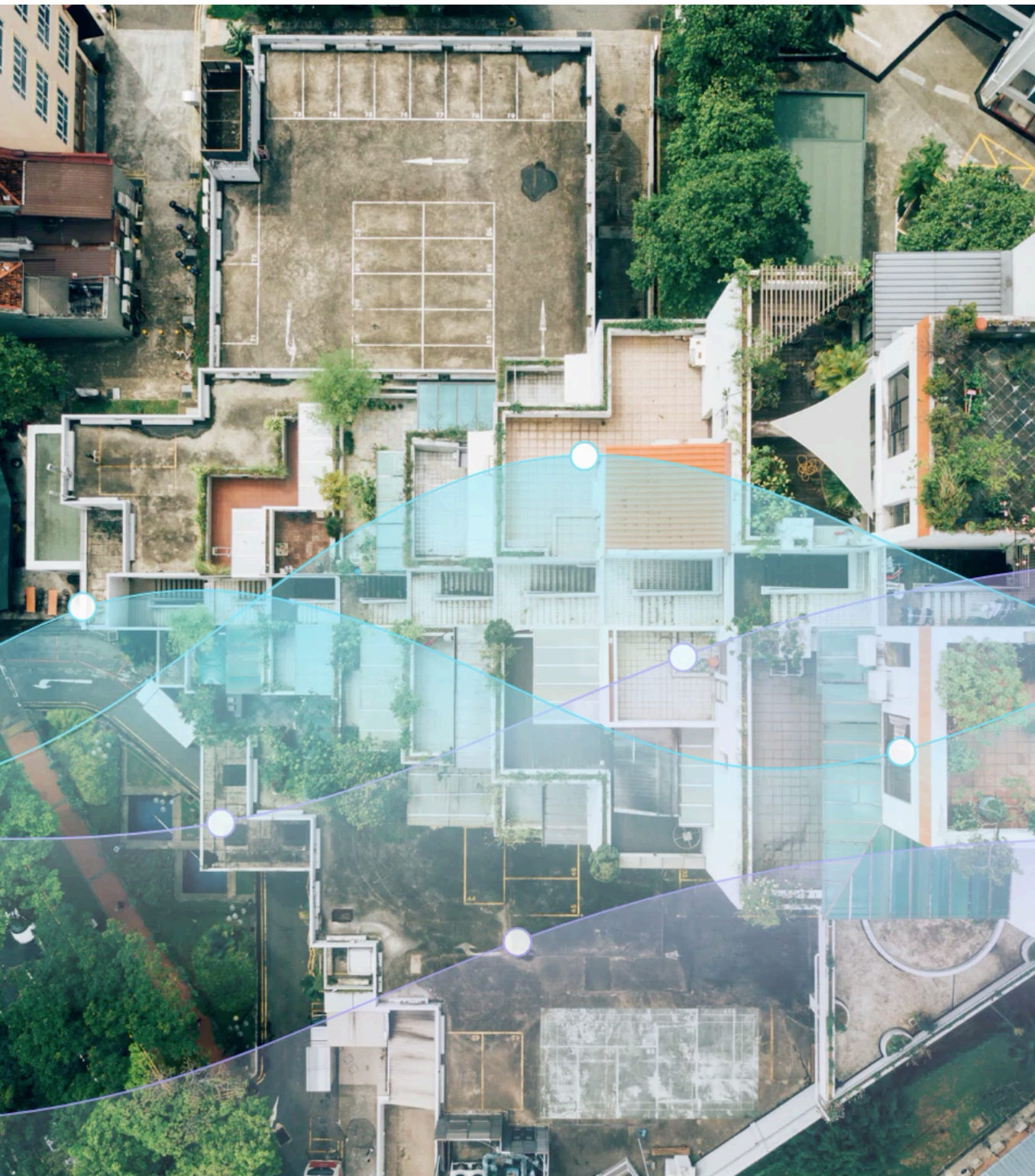
UNDER OR OVER PROMISING ON NBS?

The Value of Nature-based Solutions



SMARTER GREENER CITIES

IOT SENSORS AND REAL-TIME DATA



SENSCITY

Welcome back! Please login to your account.

Username

Password

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UN CONVENTION ON BIOLOGICAL DIVERSITY AT COP 24



(McPhearson et al, "Resilience Of and Through Ecosystem Services" 2015)



SMARTer Greener Cities

PROJECT

CITIES

COMMUNITY

WELFARE

📅 2020 - 2022

Sustainable Urban Development and Smart Cities: A Call for proposals for research projects

To be liveable, equitable, resilient and positive contributors to global sustainability, cities need to be designed and governed as complex systems where technological and digital infrastructure supports ecological-biophysical and social-institutional-economic dynamics. However, social and ecological dimensions of urban design and governance are not well integrated into "smart" city agendas.

How can investment in smart cities jointly support multiple urban objectives? Smart cities have so far failed to address nature-based solutions in urban forests, parks, and community gardens and their contribution to human well-being, including stress relief and heat mitigation. The SMARTer Greener Cities project aims to develop and test novel tools and processes for explicitly converging social, ecological, and technological systems (SETS) approaches for improving life in cities. The convergence of these approaches will promote resilient and equitable urban futures in Helsinki, Copenhagen, and Stockholm, and generate new opportunities for transformative change and increasing resilience to extreme events in other Nordic cities. The comprehensive integration of emerging science and practice connected to each of the three couplings (social-ecological (S-E), ecological-technological (E-T), and social-technological (S-T)) into a combined SETS framework is essential for the development of "smarter" (through systems) solutions for resilience and equity.

smartergreenercities.eu

The background of the entire image is a series of radiating blue lines of varying lengths, creating a sunburst or starburst effect. In the center is a stylized, light blue globe showing the continents of North America, South America, and Africa. Surrounding the globe is a circular band containing various silhouettes of life and human activity. At the top, there are several evergreen trees. Below the trees, there are silhouettes of a person running, a person on a bicycle, a person walking, and a person sitting. Further down, there are silhouettes of a person standing, a person sitting, and a person lying down. At the bottom, there are silhouettes of a person standing, a person sitting, and a person lying down. The overall theme is the interconnectedness of nature and human systems.

PUTTING NBS INTO CONTEXT

IT'S SYSTEMS ALL THE WAY DOWN

THE FOUR LAWS OF ECOLOGY

1. **Everything is connected to everything else**
2. Everything must go somewhere
3. Nature knows best
4. There is no such thing as a free lunch

Barry Commoner, *The Closing Circle* (1971)

Advancing Urban Ecology toward a Science of Cities

TIMON McPHEARSON, STEWARD T. A. PICKETT, NANCY B. GRIMM, JARI NIEMELÄ, MARINA ALBERTI, THOMAS ELMQVIST, CHRISTIANE WEBER, DAGMAR HAASE, JÜRGEN BREUSTE, AND SALMAN QURESHI

Urban ecology is a field encompassing multiple disciplines and practical applications and has grown rapidly. However, the field is heterogeneous as a global inquiry with multiple theoretical and conceptual frameworks, variable research approaches, and a lack of coordination among multiple schools of thought and research foci. Here, we present an international consensus on how urban ecology can advance along multiple research directions. There is potential for the field to mature as a holistic, integrated science of urban systems. Such an integrated science could better inform decisionmakers who need increased understanding of complex relationships among social, ecological, economic, and built infrastructure systems. To advance the field requires conceptual synthesis, knowledge and data sharing, cross-city comparative research, new intellectual networks, and engagement with additional disciplines. We consider challenges and opportunities for understanding dynamics of urban systems. We suggest pathways for advancing urban ecology research to support the goals of improving urban sustainability and resilience, conserving urban biodiversity, and promoting human well-being on an urbanizing planet.

Keywords: urban ecology, conceptual frameworks, comparative research, urban systems, complexity

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A SETS APPROACH TO ADVANCING URBAN SCIENCE FOR RESILIENCE



SETS
CONVERGENCE



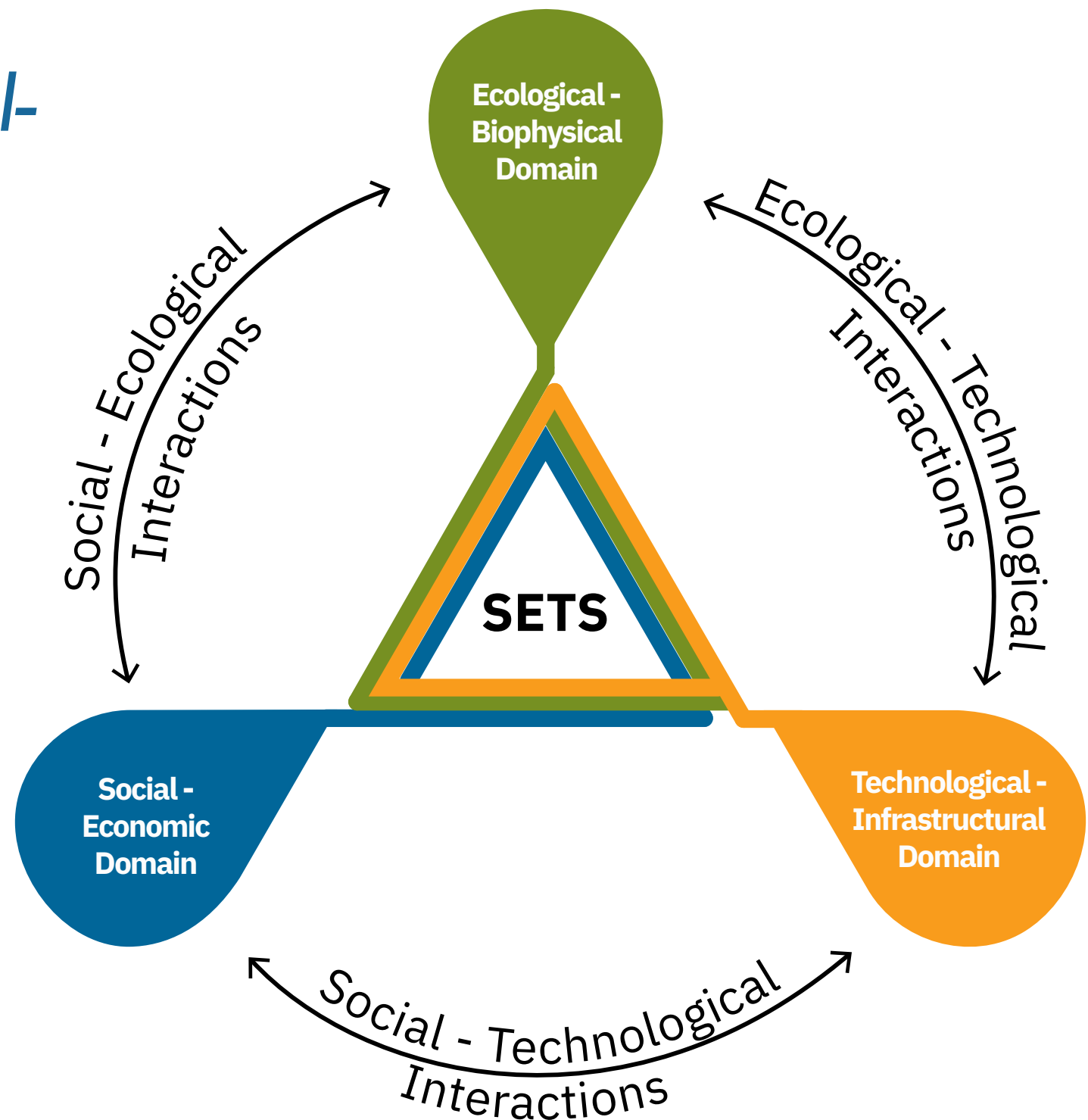
Urban Resilience to
Extremes Sustainability
Research Network

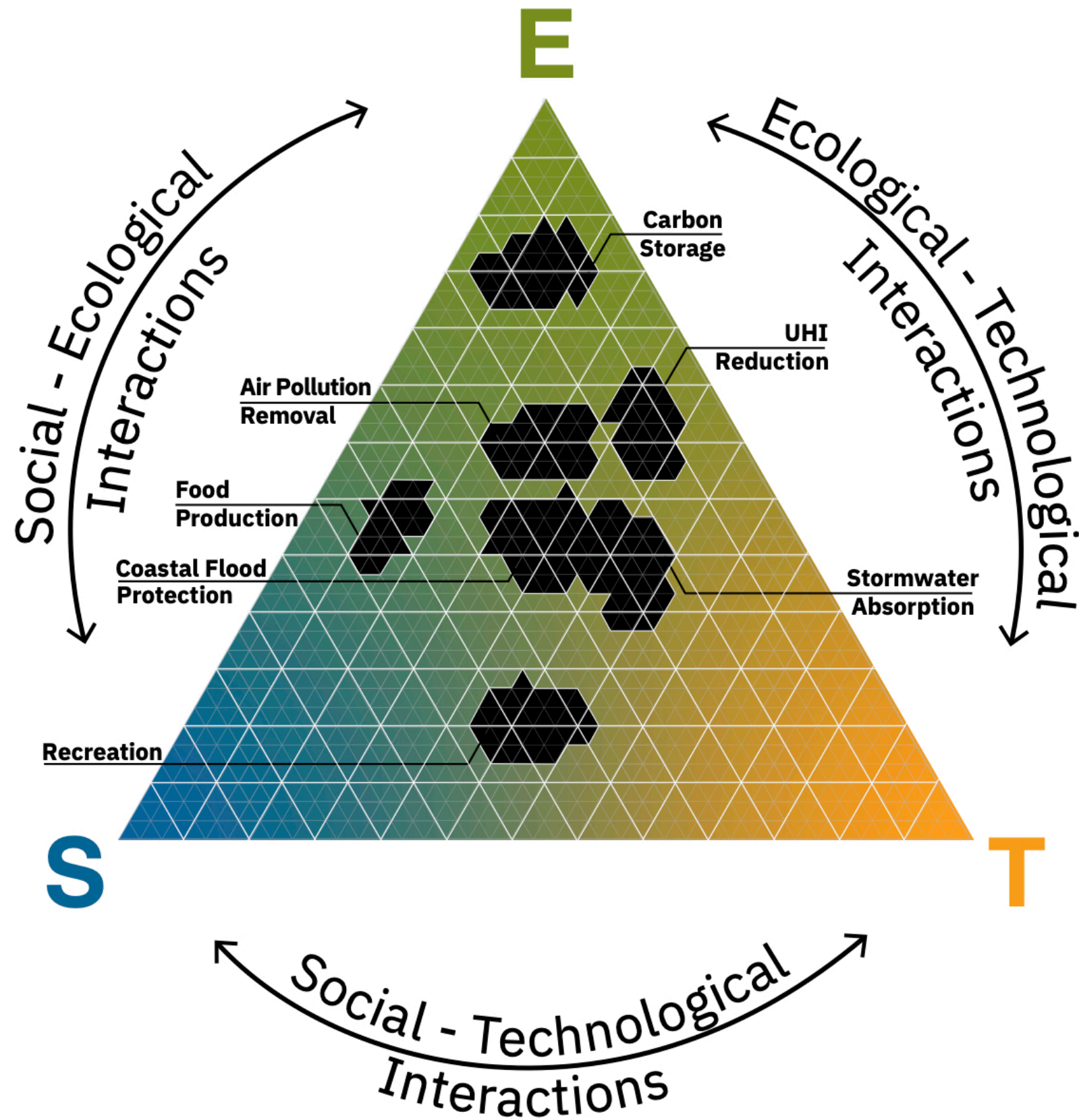
www.URExSRN.net



***SMARTer
Greener Cities***

Cities are *social-ecological-technological systems* (SETS) with embedded social structures, institutions, and drivers and dynamic feedbacks between their social, ecological, and infrastructural components.



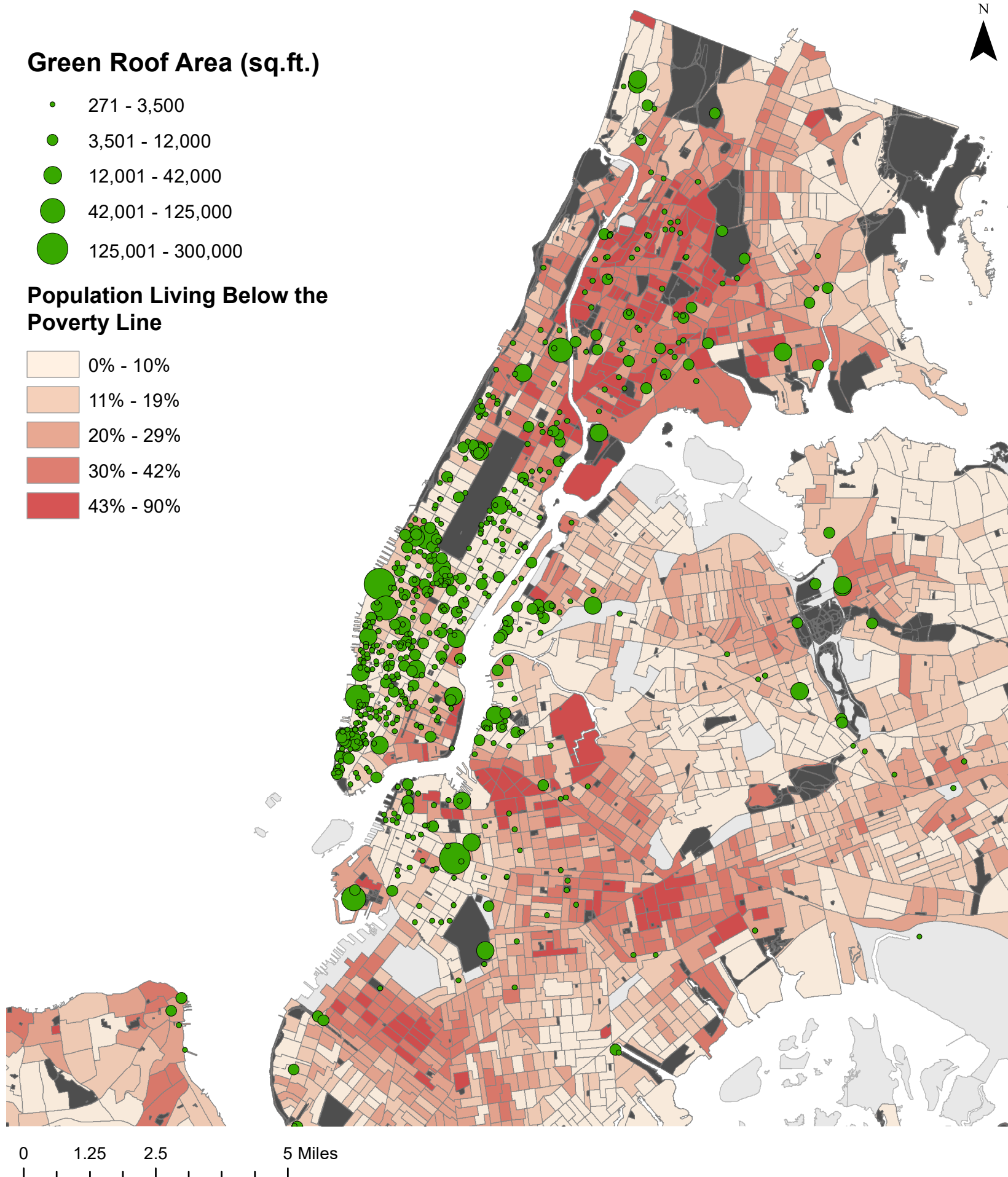


(McPhearson, Cook, Berbes, Grimm et al. *in revision*)

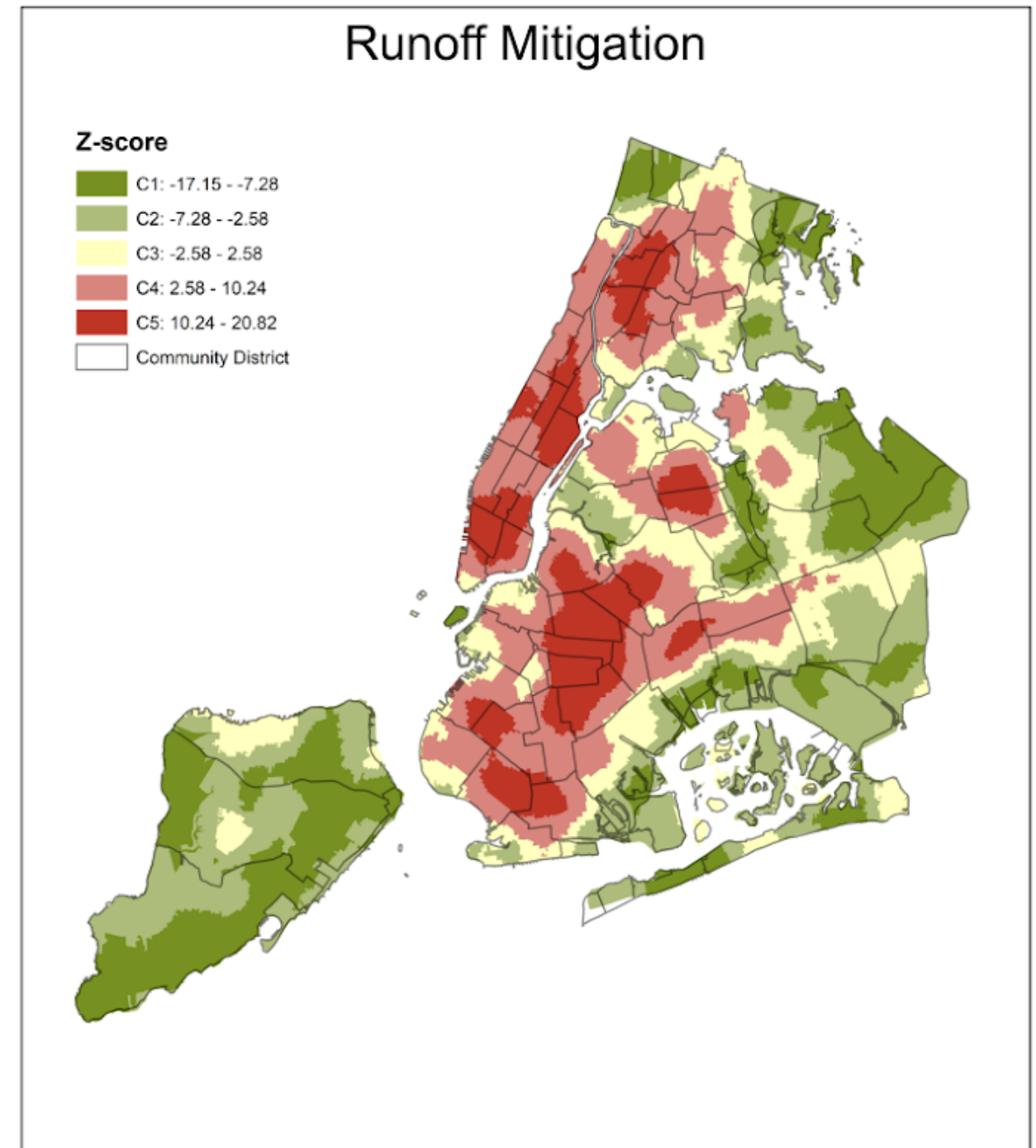
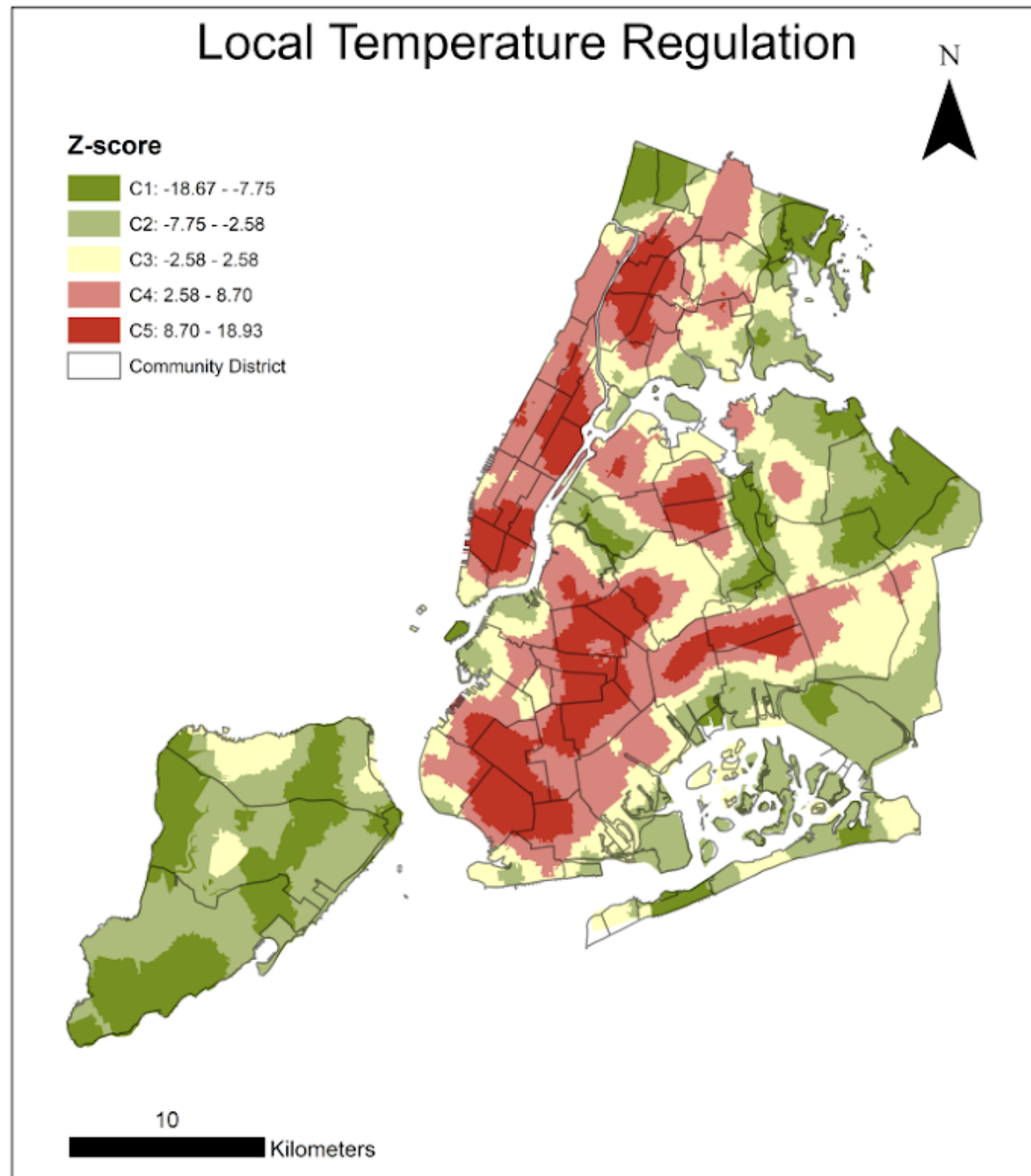
NBS for Whom?

% POPULATION LIVING IN POVERTY AND DISTRIBUTION OF EXISTING GREEN ROOFS

(Ilieva and McPhearson, in prep)




NBS FOR WHOM? HOTSPOTS OF HIGH DEMAND AND LOW SUPPLY



The background features a central illustration of the Earth, showing the continents of North and South America. The globe is encircled by a ring of green trees. Various human figures are depicted around the globe: some are running, some are walking, and one is riding a bicycle. The entire scene is set against a backdrop of radiating blue and white geometric shapes, creating a sense of movement and global connectivity.

BRINGING SCIENCE TO POLICY

NATURE-BASED SOLUTIONS

An aerial map of New York City, including Long Island Sound and the surrounding water bodies. The map is color-coded to show different flood risk zones. A light blue area covers the northern and western parts of the city, including the Hudson River valley. A darker blue area covers the central and southern parts of the city, including the East River and the area around the Statue of Liberty. A yellow area is visible in the southern part of the city, near the Statue of Liberty. The map is used as a background for the entire page.

How Decades of Racist Housing Policy Left
Neighborhoods Sweltering - The New York
Times

NEW YORK CITY STORMWATER RESILIENCY

Get Started

*STORMWATER AND INLAND FLOODING IN NEW YORK CITY:
MODELING RAINFALL AND COMBINED SLR FLOODING SCENARIOS*

HIGH RESOLUTION FLOOD SCENARIOS



VISUALIZING THE FUTURE





SHARING KNOWLEDGE

BUILDING NETWORKS

ipcc

INTERGOVERNMENTAL PANEL ON
climate change



Science and Policy
for People and Nature



NATURA

Nature-based Solutions for Urban Resilience in the Anthropocene

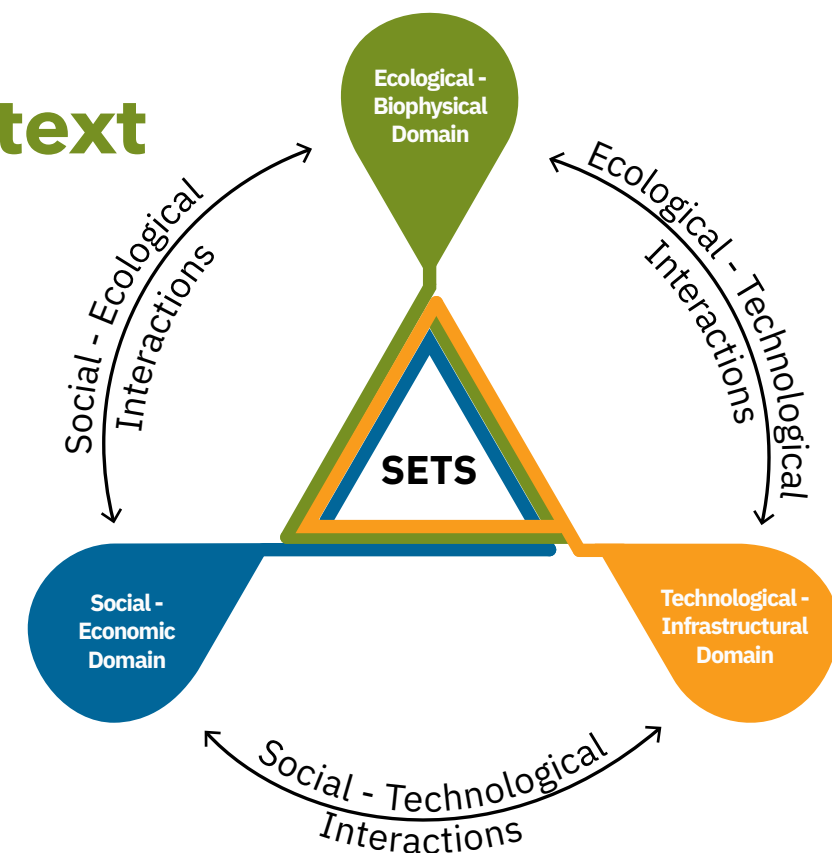
NATURA exchanges knowledge, shares data, and enhances communication among research disciplines and across the research-practice divide to advance understanding of how to build resilience to the growing threat of extreme weather events.

NATURA links over 30 networks in North, Central and South America, Africa, Asia-Pacific, and Europe to enhance connectivity among the world's nature-based solutions scholars and practitioners



NATURA will focus on addressing Five Key Gaps:

1. Synergistic benefits of **bundles of NBS** for urban resilience
2. Role of **social-cultural (S) context** in NBS outcomes
3. Role of **ecological-biophysical (E) context**
4. Role of **technological-infrastructure (T) context**
5. Role of **(SETS) interactions** in NBS outcomes



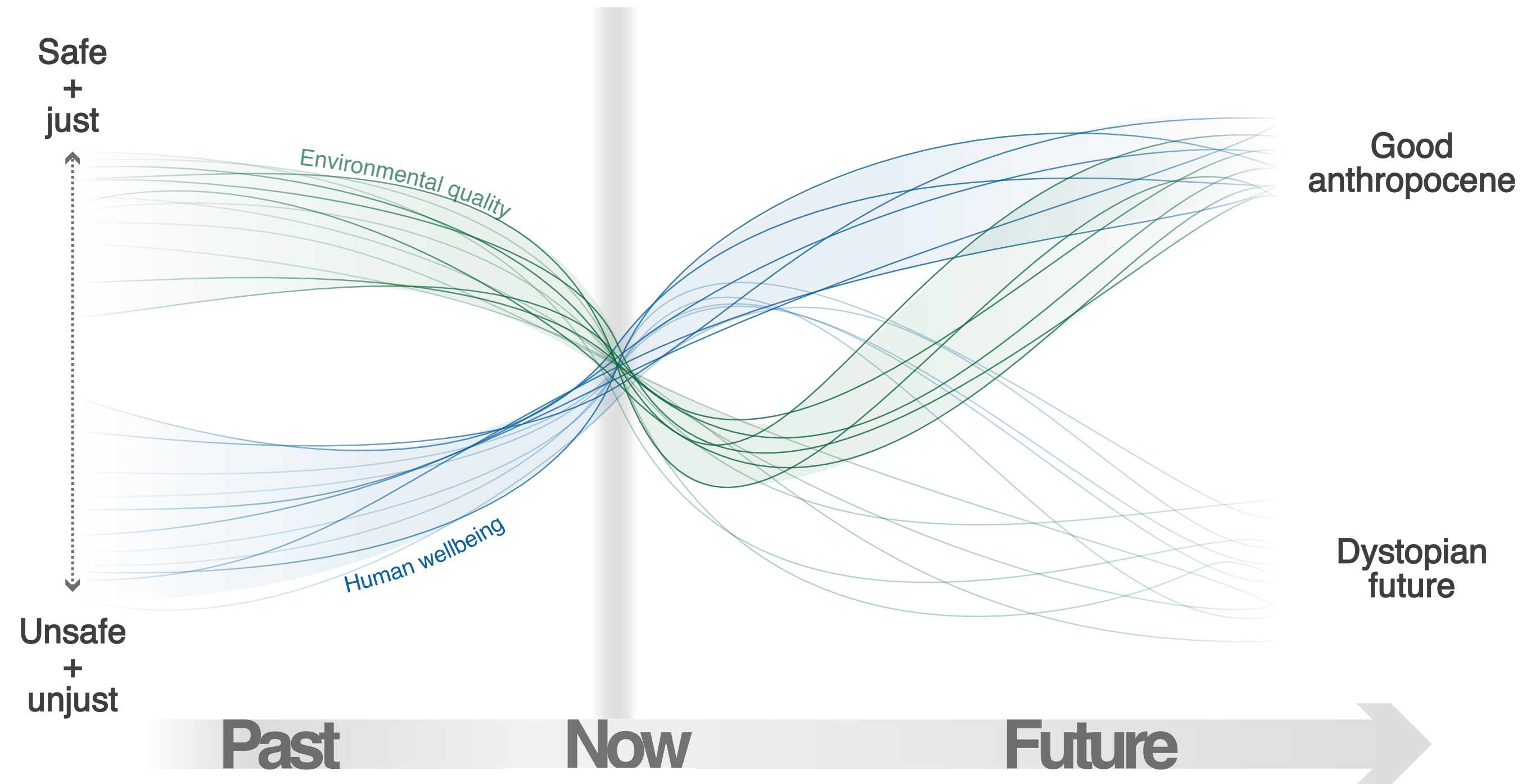
Goals of **synthesis, data sharing, and network coordination** will be accomplished through All-hands meetings, Thematic working groups, Regional nodes, and Synthesis writing workshops

Learning Exchanges will train postdoctoral scholars and graduate students and build capacity of the next generation of **researchers and practitioners** on applications of NBS through global networking.

Early-career researchers and practitioners will be sponsored by NATURA to spend five-week visits with network partners

Thematic Working Groups will create opportunities to deepen peer learning for focused groups designed and led by NATURA members

International students will be invited to participate in these exchanges, hosted by US networks, and through collaboration and co-funding with partners.



TRANSFORMATION TO A 'GOOD' ANTHROPOCENE?

(Bennett, Solan, Biggs, McPhearson et al., 2016, *Frontiers in Ecology Environment*)

NBS FOR URBAN RESILIENCE

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THANK YOU

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