Climate Resilient Development and Cities: Challenges and Opportunities in Application to New York City

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CCRUN
A NOAA RISA

RISA
Regional Integrated Sciences and Assessments

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Special thanks to many IPCC Climate Resilient Development co-authors and colleagues

World can still avoid worst of climate collapse with genuine change, IPCC says

The Guardian

Time Is Running Out to Curb Climate Change, IPCC Report Says U.N. panel of scientists say limiting global warming requires a massive and rapid shift in the world's energy supply

THE WALL STREET JOURNAL.

The way forward:

Climate-resilient development

- Integrating measures to adapt to climate change with actions to reduce emissions in ways that provide wider benefits:
  - Improving peoples' health and livelihoods
  - Reducing poverty and hunger
  - Clean energy, water and air

C. Responses in the Near Term: Urgency of Near-Term Integrated Climate Action

- C.1 Climate change is a threat to human well-being and planetary health (very high confidence). There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (very high confidence). Climate resilient development integrates adaptation and mitigation to advance sustainable development for all, and is enabled by increased international cooperation including improved access to adequate financial resources, particularly for vulnerable regions, sectors and groups, and inclusive governance and coordinated policies (high confidence). The choices and actions implemented in this decade will have impacts now and for thousands of years (high confidence). {3.1, 3.3, 4.1, 4.2, 4.3, 4.4,4.7, 4.8, 4.9, Figure 3.1, Figure 3.3, Figure 4.2} (Figure SPM.1; Figure SPM.6)

Source: AR6 Synthesis Report: Climate Change 2023

Outline

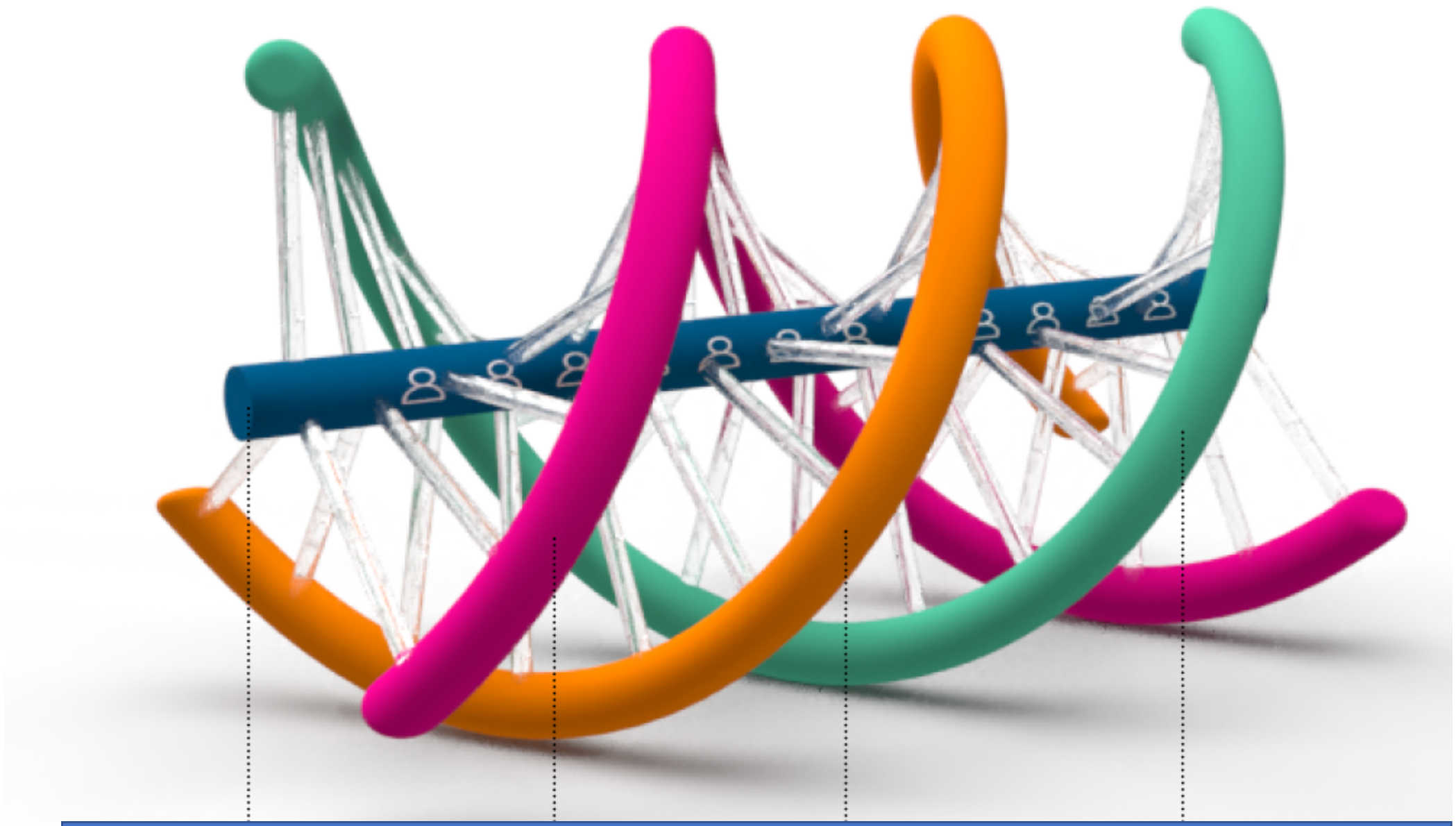
- What is climate resilient development (CRD)
- Cities as window of opportunity
- Challenges and opportunities in applying CRD to New York City – as example

What is Climate Resilient Development?

Background - CRD

- Attempting to link together climate adaptation, climate mitigation and sustainable development (attainment of UN SDGs)
- Emergent concept with the IPCC/UNFCCC world – Paris Climate Agreement
- Term used at COP26 and COP27
- Significant component of IPCC AR6, WG2 published 2022
- Presented as pathways
- Contested space between WG2 and WG3; confirmed in the IPCC Synthesis report released last week
- A rapidly narrowing window to enable climate resilient development
- Some examples city emerging

IPCC
AR6



Climate Resilient Development

Climate Adaptation

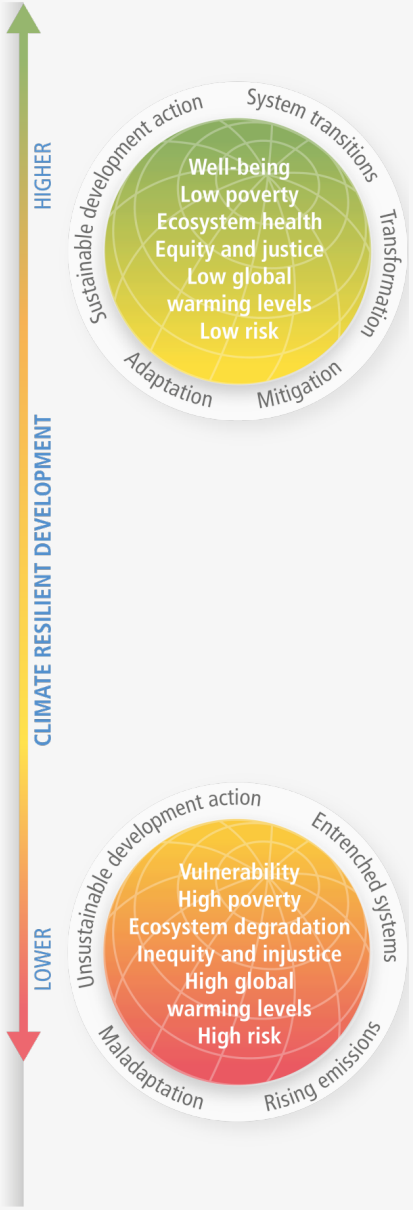
Climate Mitigation

(Sustainable) Development

Our future?

- Reduced climate risks – adaptation
- Reduced greenhouse gas emissions – mitigation
- Enhanced biodiversity
- Achieved the Sustainable Development Goals

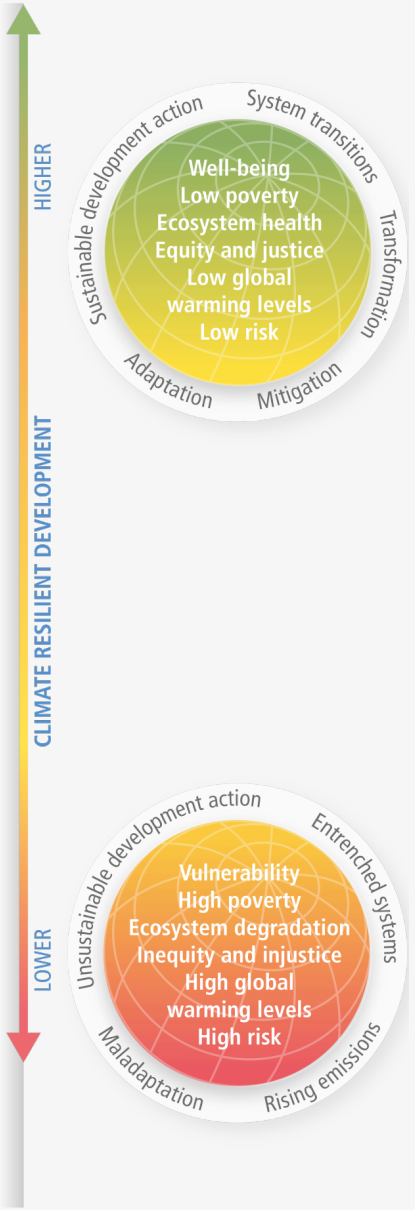
This is Climate Resilient Development.



Climate Resilient Development

The solutions framework:

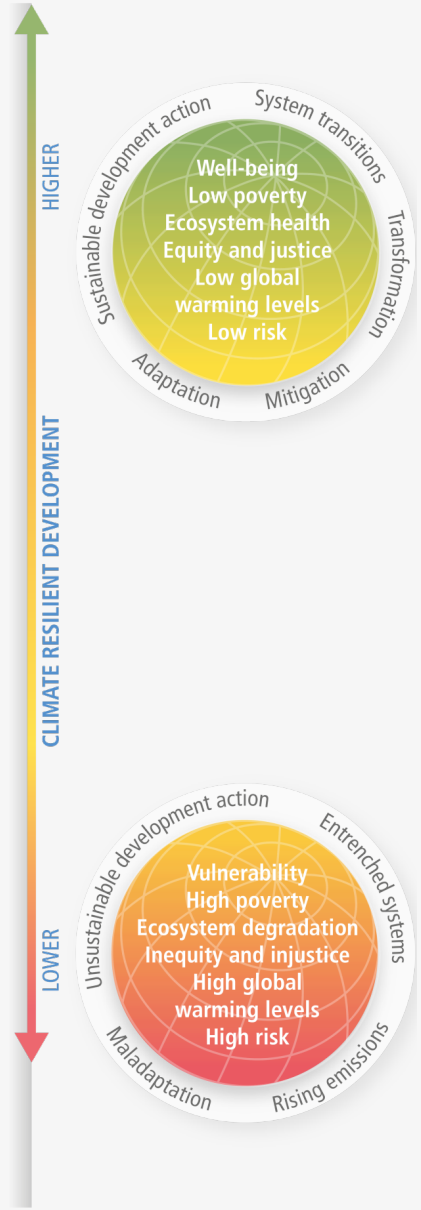
- Is considered across government and all of civil society
- Involves everyone (governments, citizens, communities, educational institutions, the media, investors and businesses) – forming partnerships



Climate Resilient Development

The solutions framework that needs to:

- Involve marginalized groups
- Prioritizes equity and justice – distributional, procedural, and recognitional justices
- Reconciles different interests, values and world views

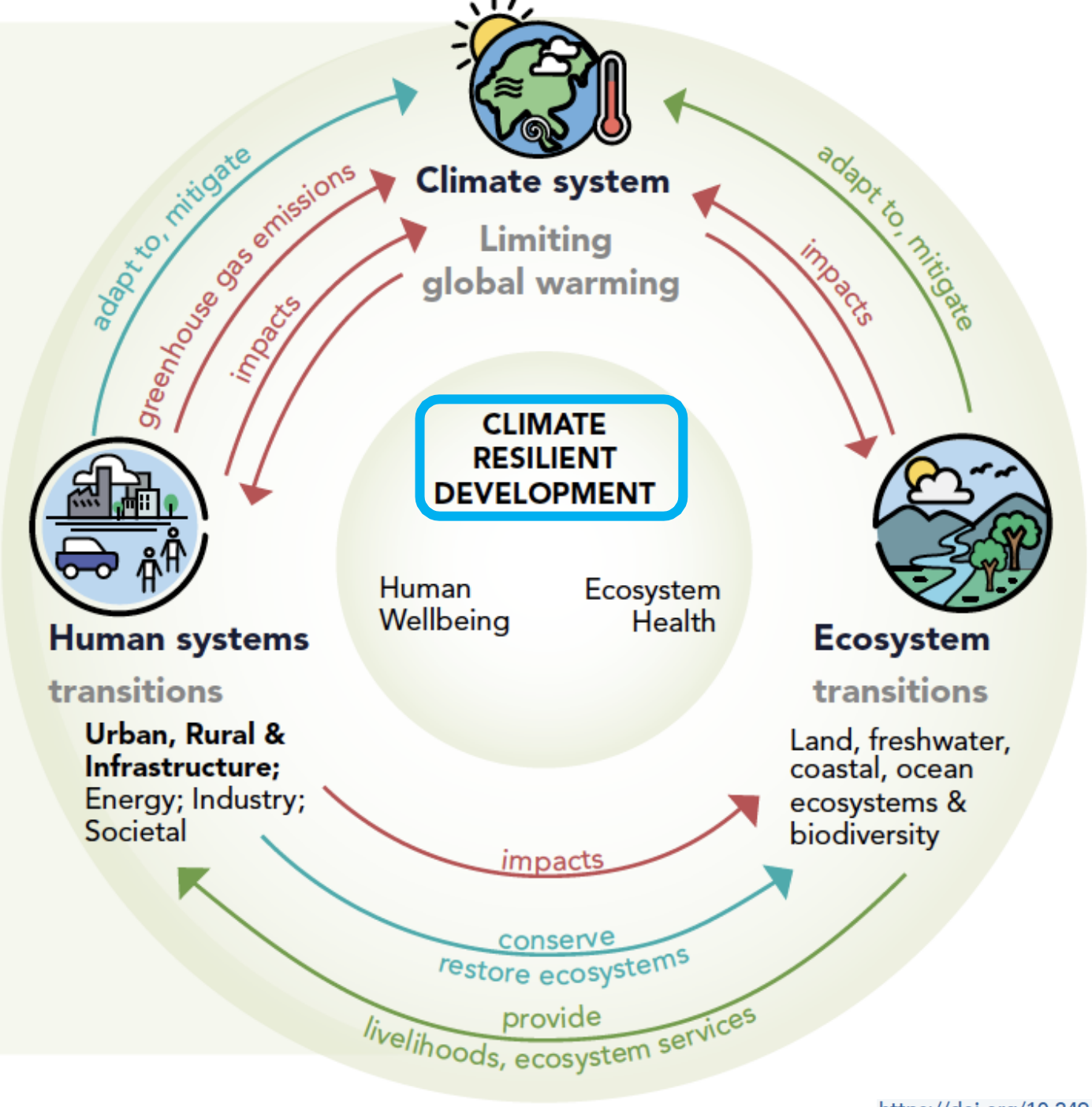


[Mika Baumeister / Unsplash; Aulia Erlangga/CIFOR CC BY-NC-ND 2.0]

Figure 1: Climate Resilient Development through transitions in climate, ecosystems and human society

Human systems and ecosystems are interconnected. To move towards goals of human well-being and ecosystem health leading to overall CRD, system transitions are needed, of which the urban, rural, and infrastructure systems transition is vital. Key enablers for climate adaptation and CRD include inclusive governance and institutional capacity; finance; monitoring and evaluation; technology and innovation; lifestyle and behaviour change; and attention to culture and heritage.

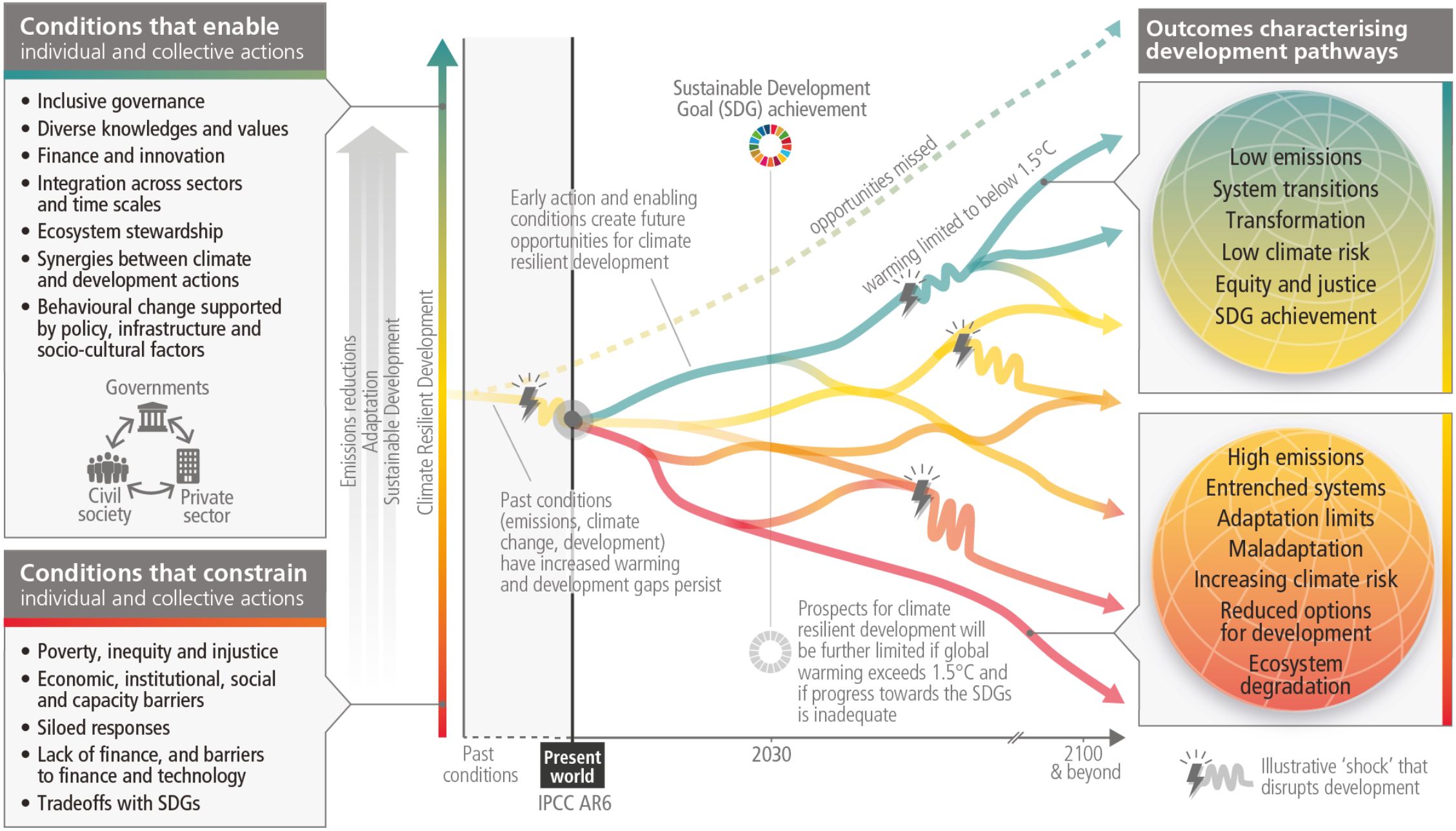
Source: Derived from IPCC AR6 WGII, Summary for Policymakers, Figure SPM.1.



https://doi.org/10.24943/SUPSV209.2022

IPCC, AR6 SYN Report 2023

Multiple interacting choices and actions can shift development pathways towards sustainability



Cities as a Window of Opportunity (for Climate Resilient Development)

Cities and urban areas offer critical spaces to realize adaptation and mitigation simultaneously with significant potential co-benefits, while also pre-empting potential trade-offs.

Sarajevo, Bosnia-Herzegovina

Cities have an oversized role to play

By 2050 urban areas could be home to two-thirds of the world's population. Reimagining Cities

Effective options to link adaptation, mitigation and development in the context of sustainability for all

- Nature-based and engineering approaches together
- Establishing green and blue spaces – e.g., carbon storage
- Urban agriculture
- Social-safety nets for disaster management

Wider benefits

- Public health improvements
- Ecosystem conservation

How to accelerate urban adaptation and mitigation – from IPCC WG2 and WG3

[Axel Fassio/CIFOR CC BY-NC-ND 2.0]

- Political commitment and follow-through across all levels of government
- Institutional framework: clear goals, priorities that define responsibilities
- Enhancing knowledge of impacts and risks improves responses
- Monitoring and evaluation of adaptation measures are essential to track progress
- Focus on equity and justice

Red Hook, Brooklyn, NYC

Importance of equity and justice

- Equity and justice as front and center to climate action; more than a moral issue or position
- IPCC Assessment evidence that adaptation and mitigation actions are most effective when the process is inclusive, transparent, and co-generative
- Equity and justice - can be promoted through addressing limits to climate action, promoting enabling conditions (e.g., governance capacity, knowledge, access to technology, and financing), and building flexible decision-making processes

Concern for Maladaptation and ‘Mal’ Mitigation

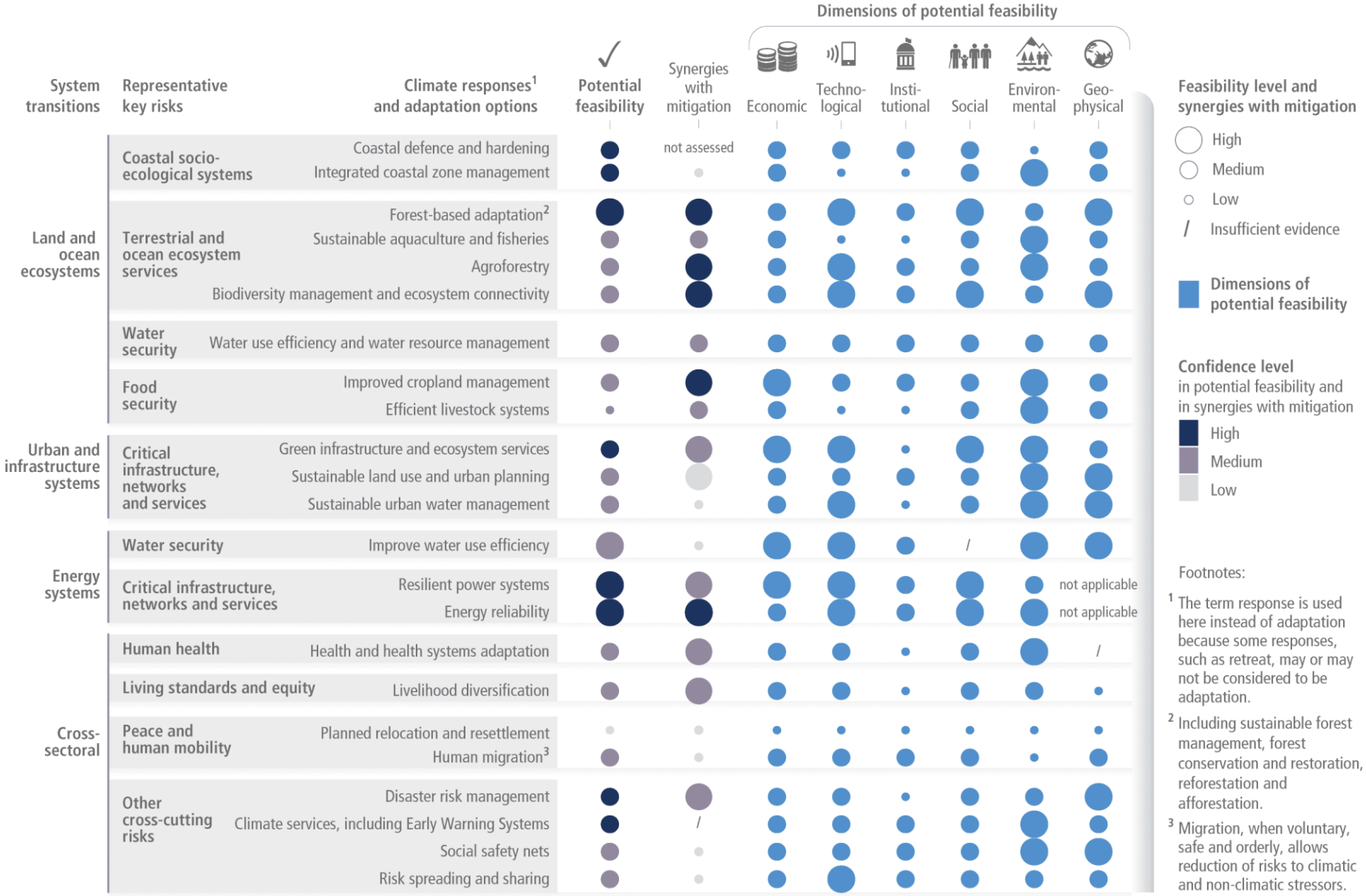
Adaptation and mitigation that results in unintended consequences

The most disadvantaged groups are most affected by maladaptation.

Connection between urban adaptation and mitigation in IPCC WG2 Report - 2022

Diverse feasible climate responses and adaptation options exist to respond to Representative Key Risks of climate change, with varying synergies with mitigation

Multidimensional feasibility and synergies with mitigation of climate responses and adaptation options relevant in the near-term, at global scale and up to 1.5°C of global warming



Footnotes:

[1] The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

[2] Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.

[3] Migration, when voluntary, safe and orderly, allows reduction of risks to climatic and non-climatic stressors.

Connection between urban adaptation and mitigation in IPCC WG2 Report - 2022

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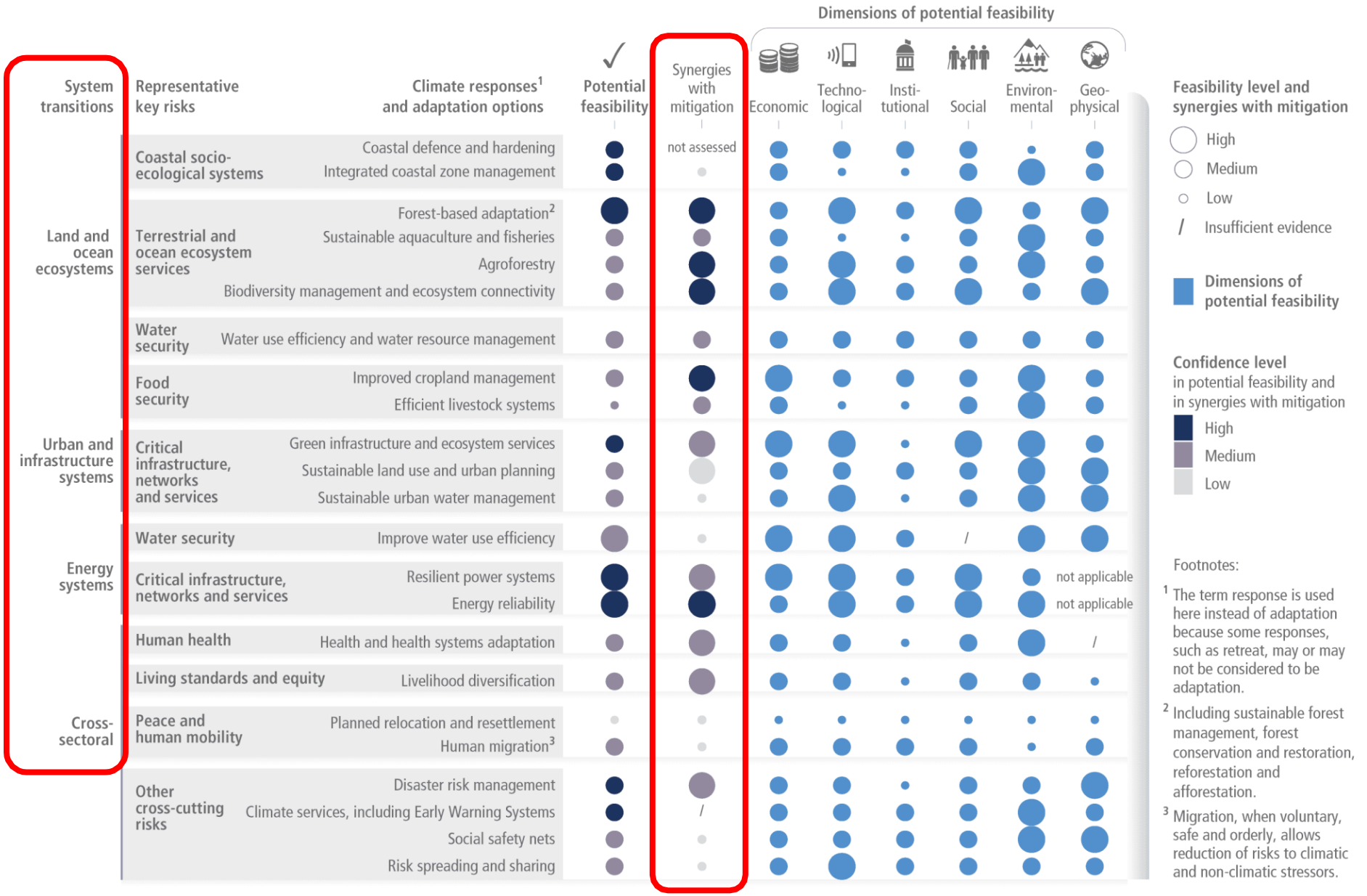
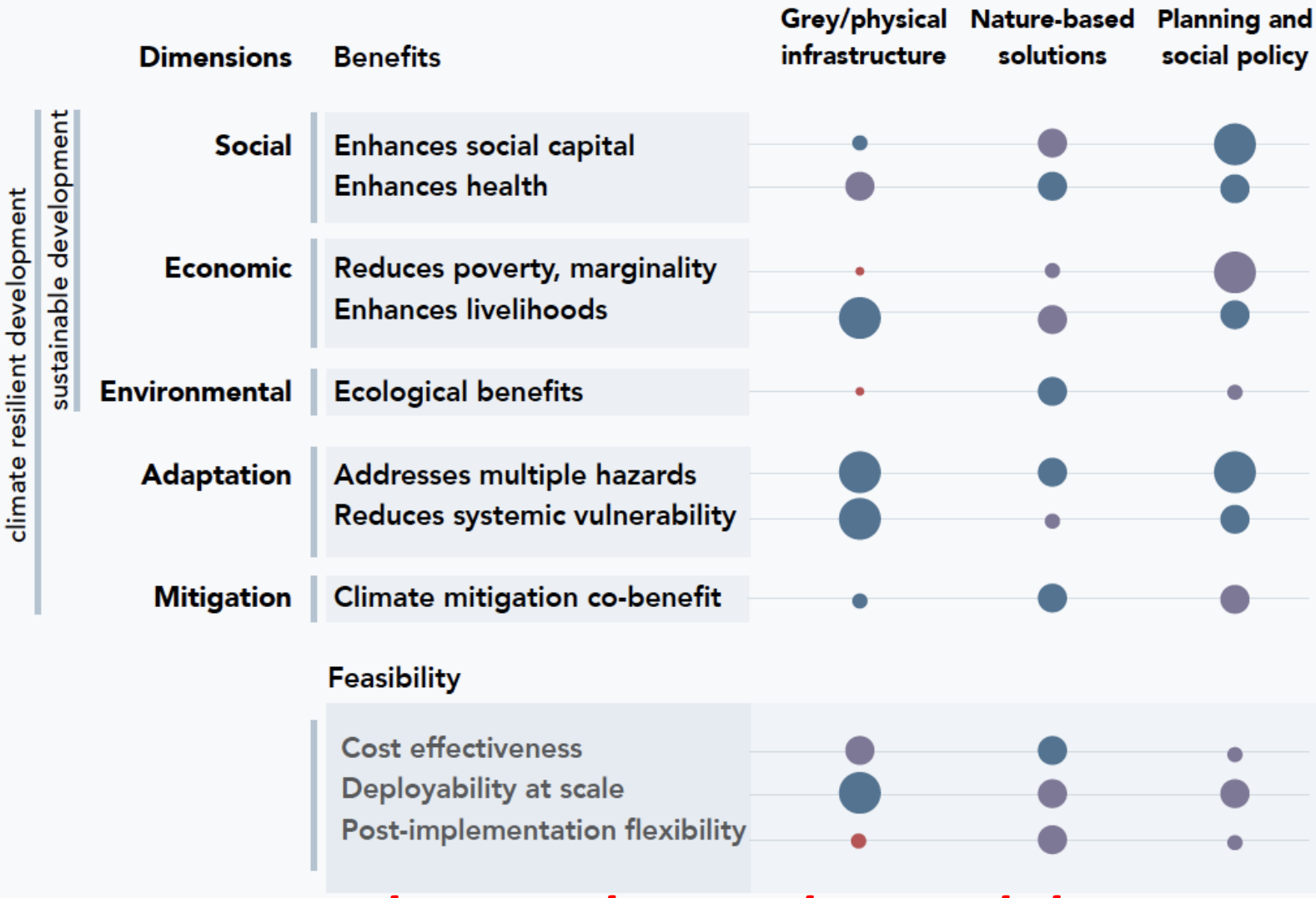


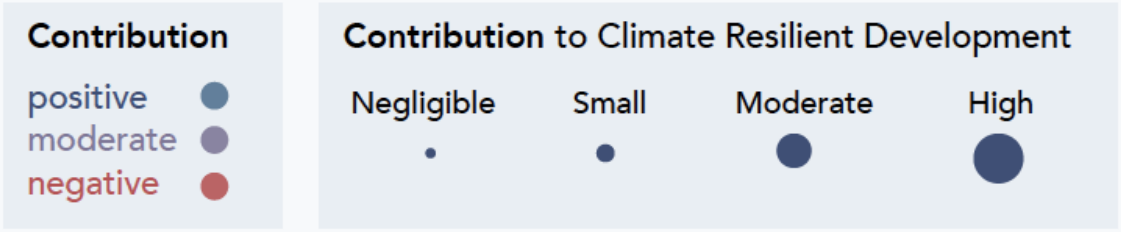
Contributions of urban adaptation options to CRD



Broad and multi-faceted contribution of urban adaptation to climate resilient development

Grey/physical Infrastructure	Dikes, seawalls; water storage, greywater use; slope revetments; air conditioning; passive cooling; upgrading trasnport, energy, water & sanitation infrastructure; information & communication technologies; urban design & building regulations
Nature-based solutions	Urban agriculture; street trees; green roofs; parks and open spaces; community gardens; rain gardens; bioswales; retention ponds; riverbanks; floodplains and watershed restorations
Planning and social policy	Land use planning; social safety nets; emergency and disaster risk management; health services; climate education; heritage conservation

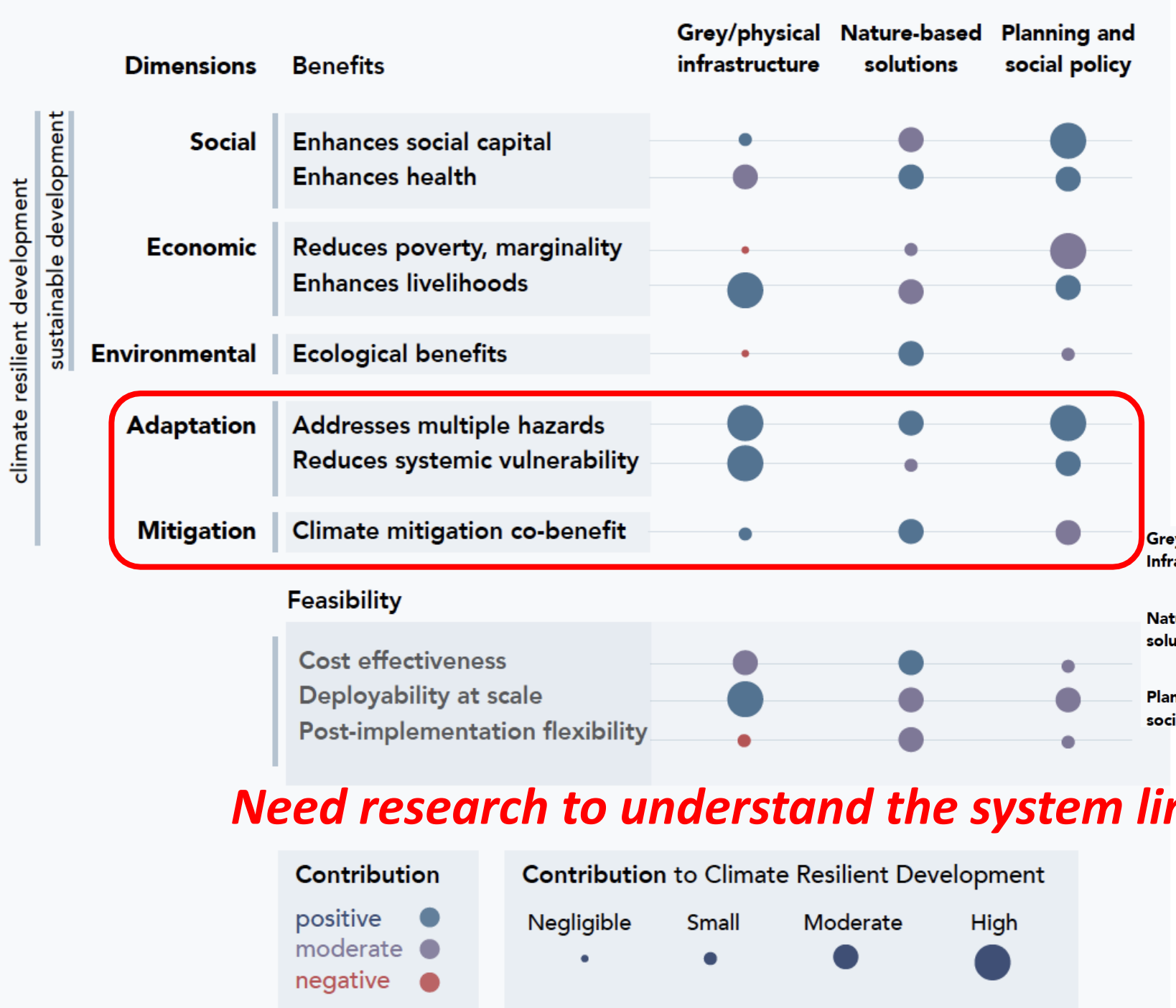
Need research to understand the system linkages



SUP VOLUME II

What the Latest Science on **Impacts, Adaptation and Vulnerability** Means for Cities and Urban Areas

Contributions of urban adaptation options to CRD



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SUP VOLUME II

What the Latest Science on **Impacts, Adaptation and Vulnerability** Means for Cities and Urban Areas

There are multiple opportunities for scaling up climate action

Source: IPCC, AR6
Synthesis Report, 2023

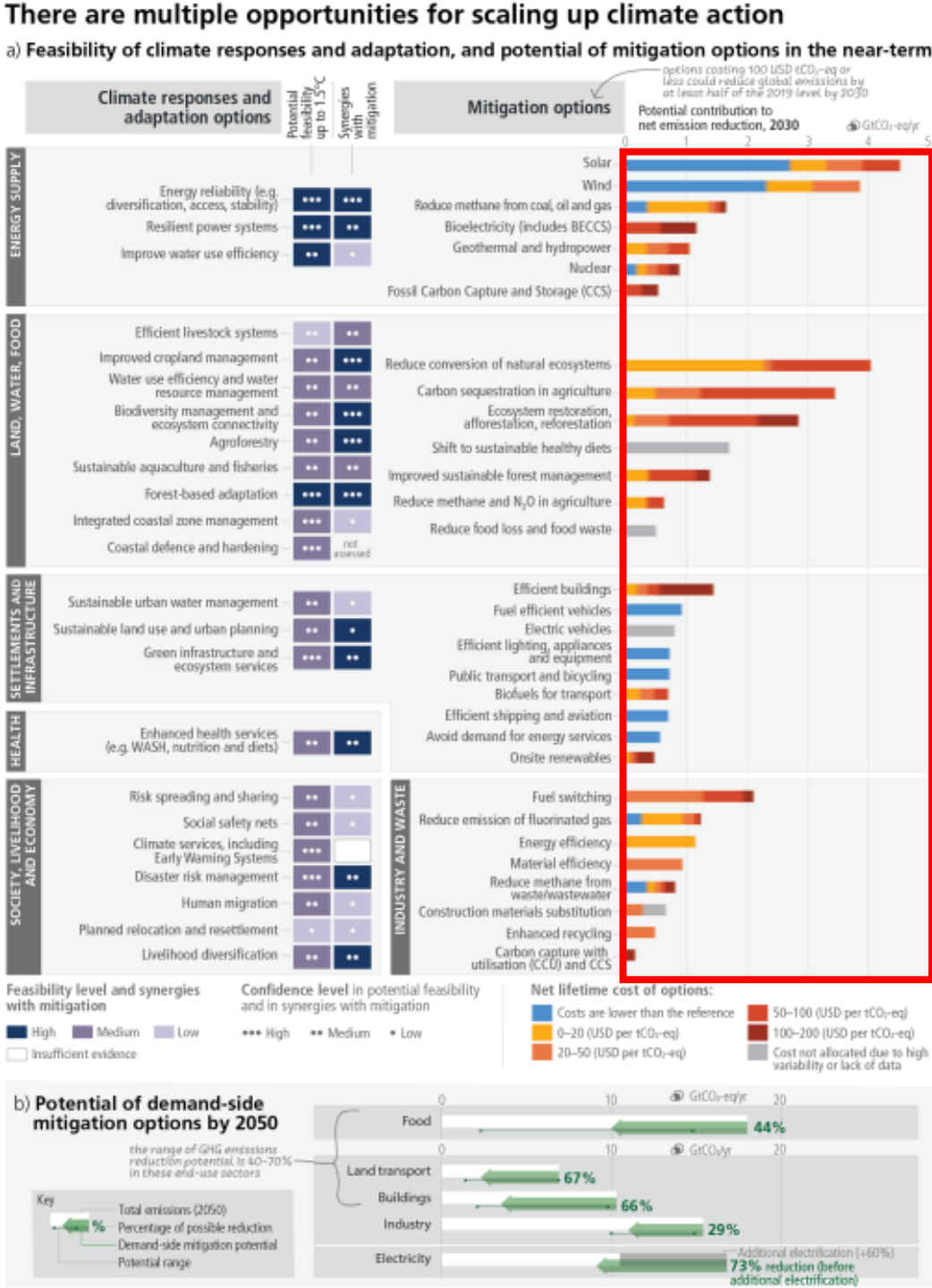
Energy Supply

Land, Water, Flood

Settlements and Infrastructure

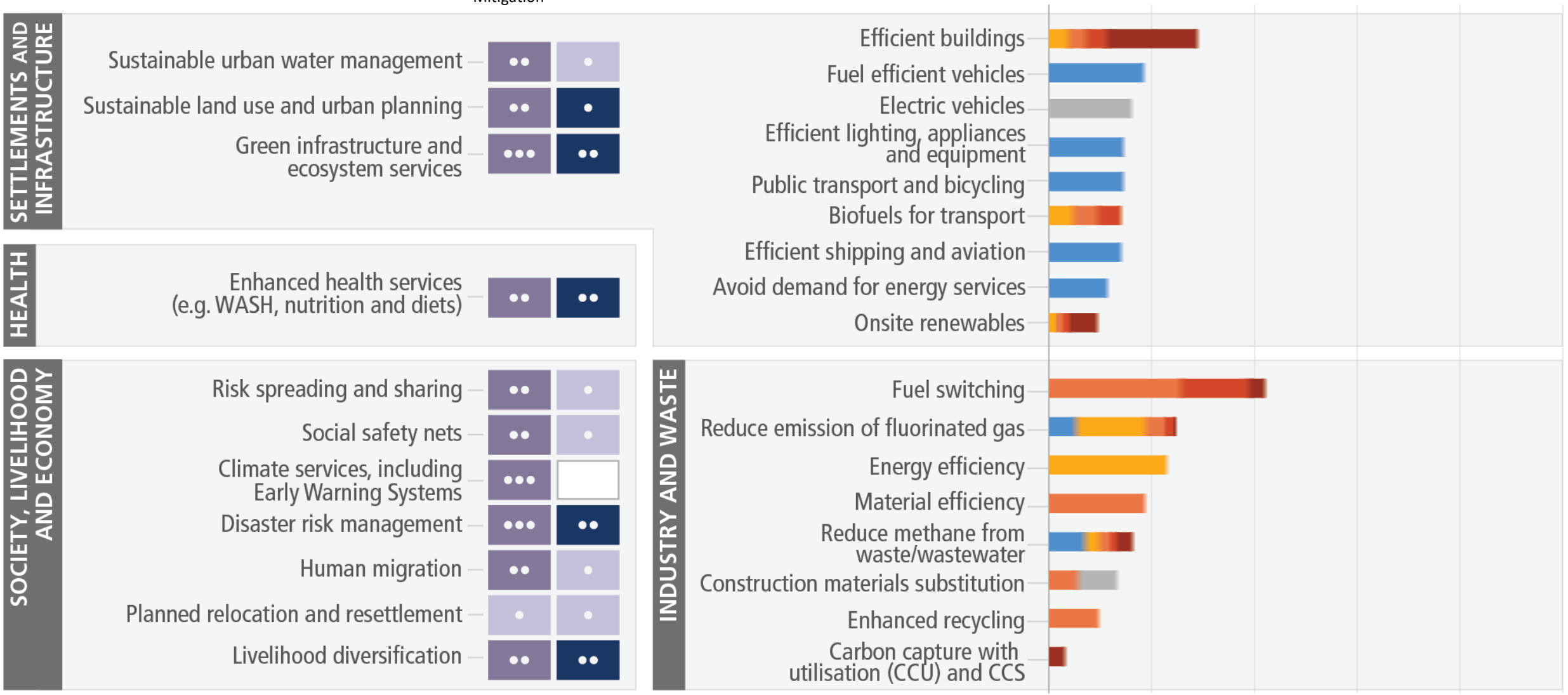
Health

Society, Livelihood and Economy



1.5 with Mitigation

with Mitigation



Feasibility level and synergies with mitigation

High Medium Low

Insufficient evidence

Confidence level in potential feasibility and in synergies with mitigation

••• High •• Medium • Low

Net lifetime cost of options:

Costs are lower than the reference

0–20 (USD per tCO_2-eq)

20–50 (USD per tCO_2-eq)

50–100 (USD per tCO_2-eq)

100–200 (USD per tCO_2-eq)

Cost not allocated due to high variability or lack of data

Early Case Studies of Urban Climate Resilient Development

Climate Resilient Development Pathways in European Cities -European Chapter 13, WG 2, AR6

- Malmö, Sweden

Since the 1990s, Malmö has been transitioning towards an environmentally, economically and socially sustainable city, investing in eco-districts (redeveloped areas that integrate and showcase the city's sustainability strategies) and adopting ambitious adaptation and mitigation targets connecting to the UN SDGs and comprehensive plan. Malmö also engages stakeholders via dialogue with residents, collaboration with universities and partnerships with industry and service providers

- Milan, Italy

Milan is taking a CRD approach to new developments. From 2020, new buildings must be carbon neutral and reconstructions must reduce the existing land footprint by at least 10%. The Climate and Air Plan (CAP) and the city's Master Plan focus on low-carbon, inclusive and equitable development. The CAP is directed at municipal and private assets, and individual- to city-scale actions. In 2020, Milan released a revised Adaptation Plan and the Open Streets Project to ensure synergies between the COVID-19 response and longer-term CRD. Milan emphasizes institutionalization of CRD via a dedicated resilience department, and through active participation in climate networks and projects that support learning and exchange.

Bosco Verticale (Vertical Forest)

Enabling Conditions for CRD: Case Study of Halle (Saale) and Mannheim, Germany

Tactics

- Regulatory instruments
- Persuasive tools
- Financial instruments
- Market participation and location development
- Organizational development

Actors

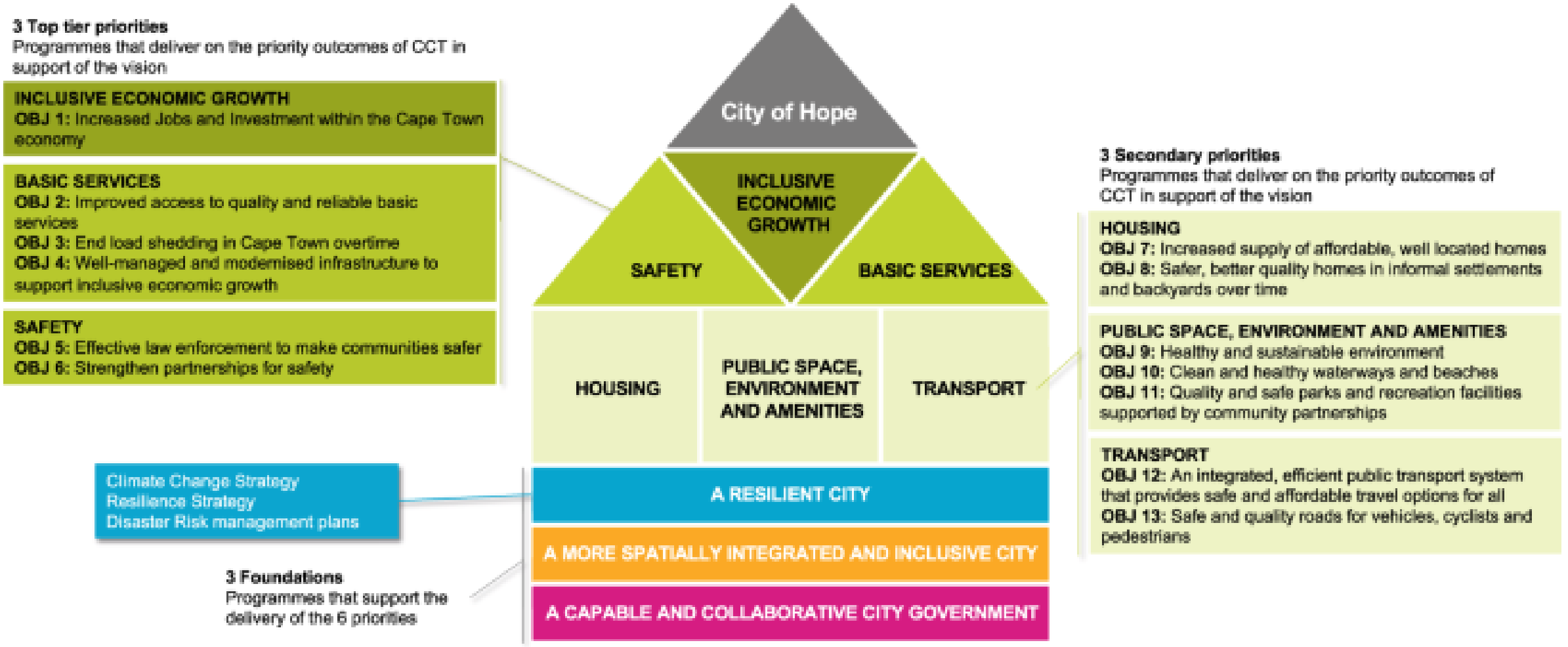
- Policy
- Administration
- Economy
- Interest groups
- Education
- Local community

Source: Izdebska et al. 2022

Transition Management and CRD

- Aims to identify options for transformation through a governance approach for sustainability that can resolve ongoing societal problems (Loorbach 2007).
- Cooperative and collaborative process
- Three innovation spheres: strategic, tactical and operational (Izdebska et al. 2022) or what is otherwise described as root, context, and proximate drivers (Solecki et al. 2017)
  - Strategic – cultural aspects such as values, identity, vision, goal setting
  - Tactical – structural shifts in resource allocation, incentives, laws, policies, and institutional arrangements
  - Operational – carrying out of experiments and learning

Cape Town, South Africa and CRD: Connection to an Integrated Development Plan



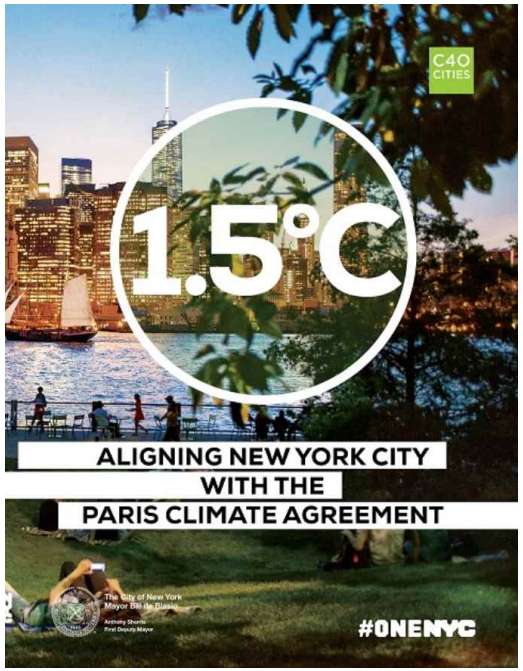
Simpson, N.P., Simpson, K.J., Ferreira, A.T. *et al.* Climate-resilient development planning for cities: progress from Cape Town. *npj Urban Sustain* **3**, 10 (2023). https://doi.org/10.1038/s42949-023-00089-x

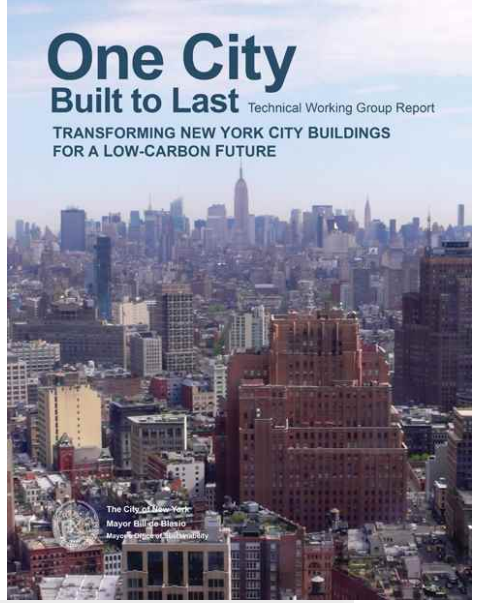
Examples of programs in the City of Cape Town's Integrated Development Plan (2022–2027) which target key local developmental imperatives and align with CRD outcomes while also addressing one or more dimension of climate change response

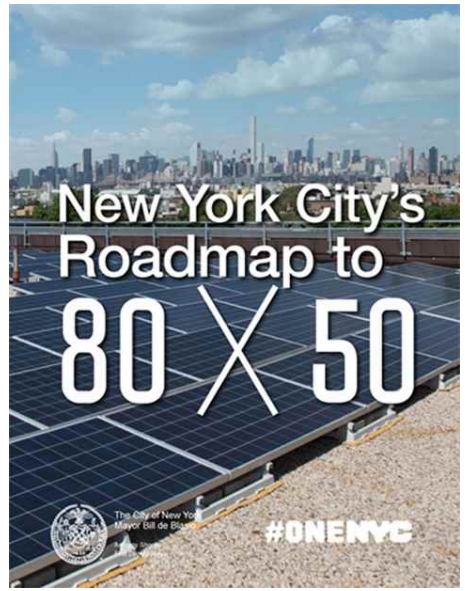
Outcomes	Integrated Development Plan programs
Equity and Justice	• Disaster risk reduction and response program • Informal Settlements upgrading program, and Mainstreaming basic service delivery to informal settlements and backyard dwellings program.
Inclusion	• Spatial integration and transformation program
Knowledge Diversity	• Evidence-based decision-making program
Ecosystem stewardship	• Environmental management program • Healthy urban waterways program

Integrating CRD in a City:

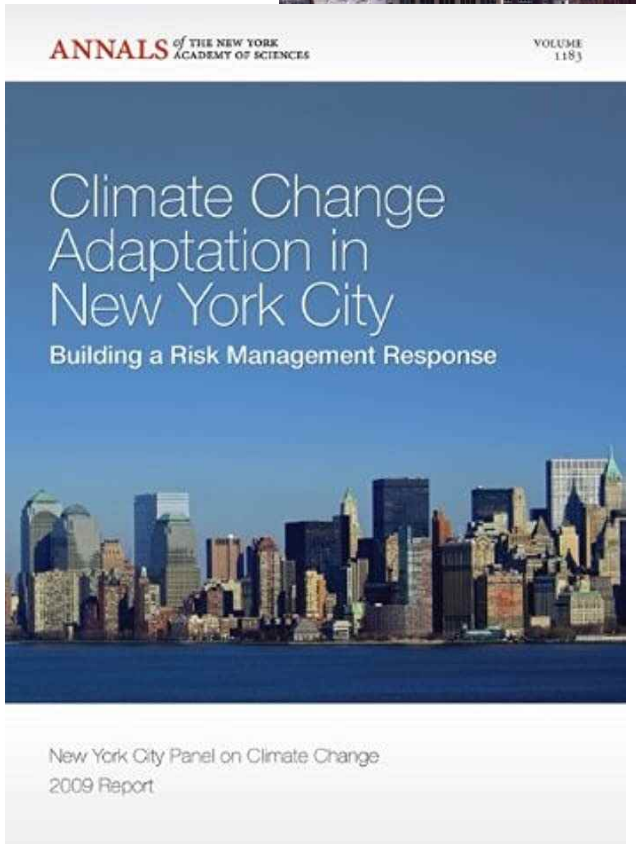
Challenges and Opportunities in Retrofitting New York City

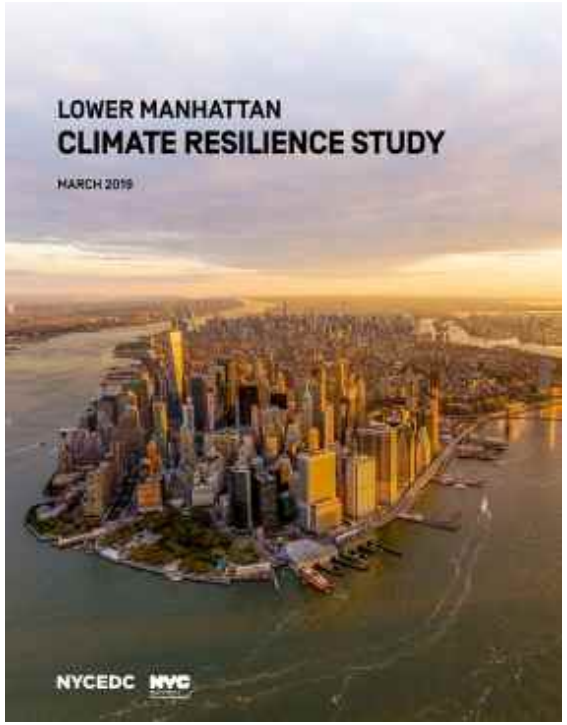


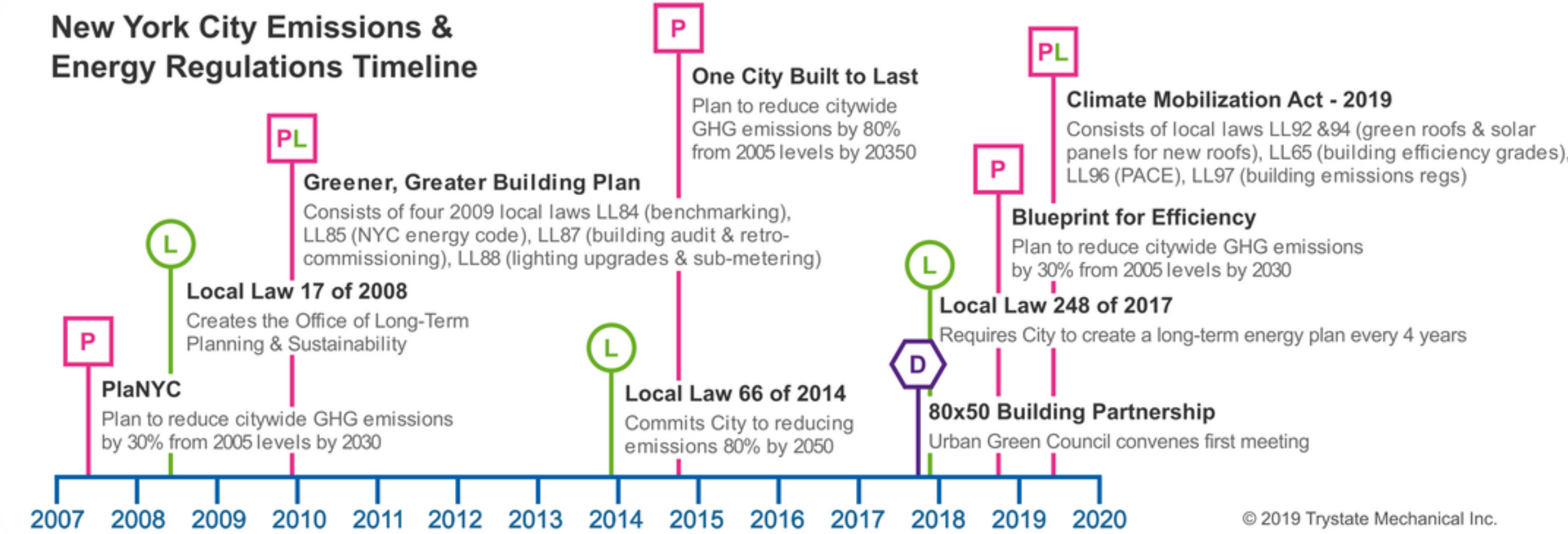




New York City as a Global Leader in Climate Action

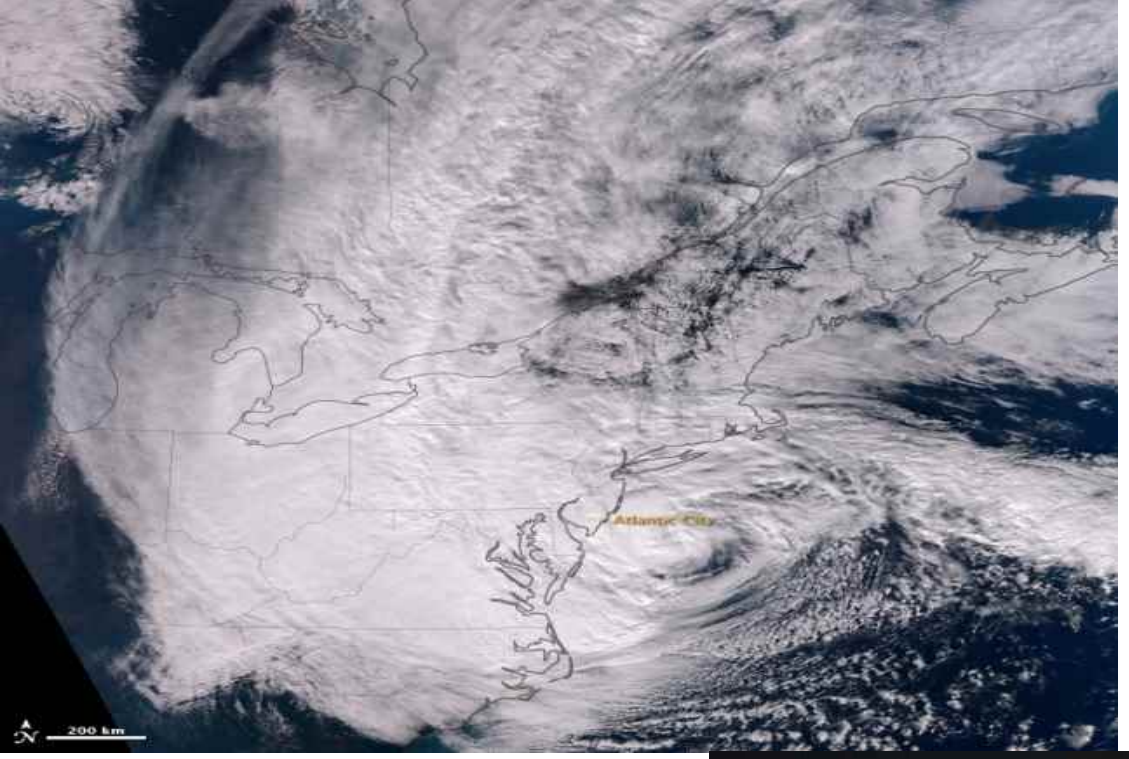




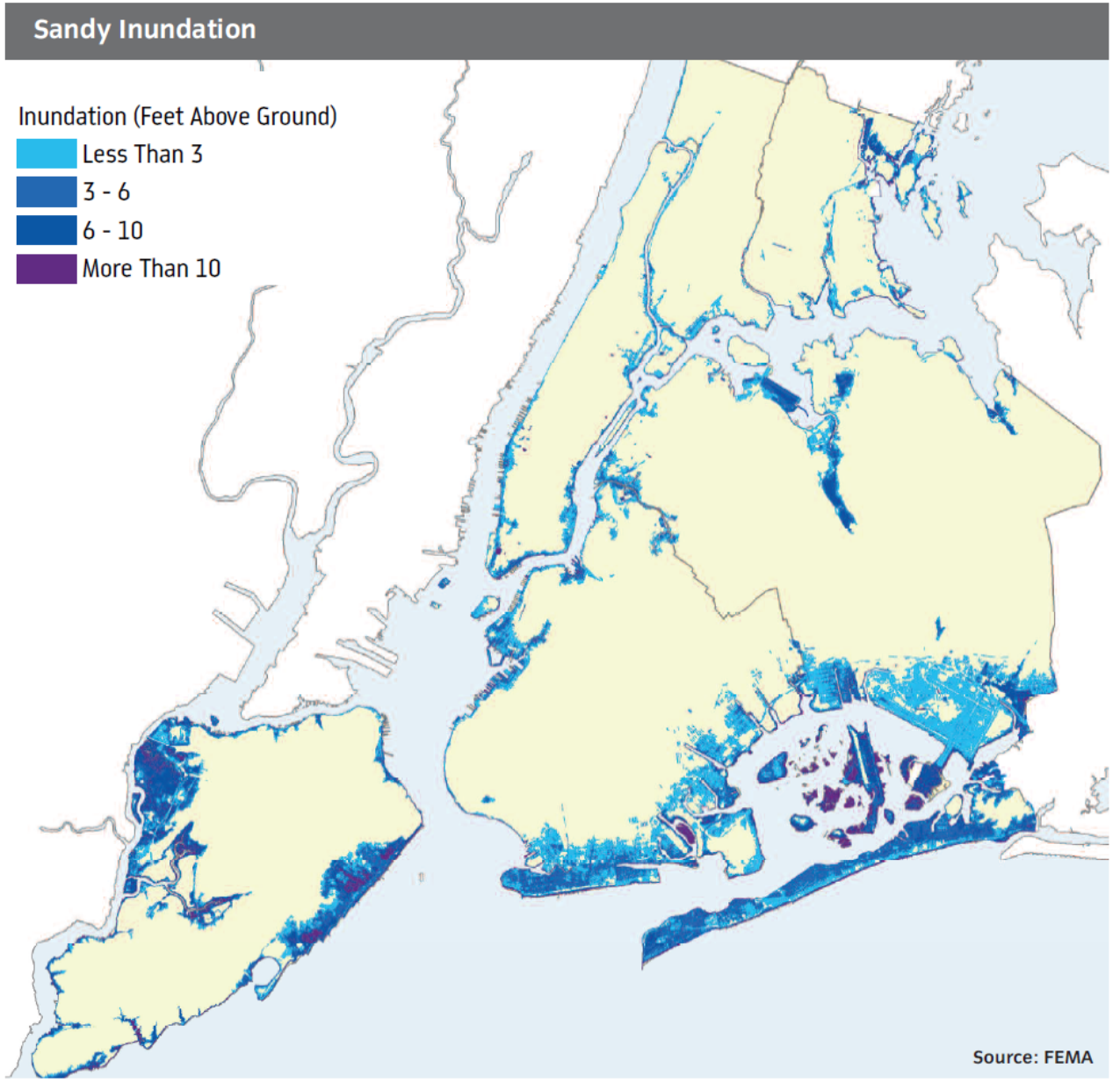


- Groundbreaking climate legislation sets carbon emissions caps for energy use in NYC's large buildings starting in 2024 and to have zero emissions from buildings by 2050.
- Covers ~50,000 buildings and nearly 60 percent of the city's building area: 59 percent residential and 41 percent commercial
- Requires 40 percent citywide emissions reductions by 2030 from a 2005 baseline.
- For covered buildings, that's a 26 percent carbon cut (5.3 million metric tons) from today, the equivalent of San Francisco's citywide emissions
- Many buildings are significantly above emissions limits and will require comprehensive retrofits or alternate compliance by 2030.

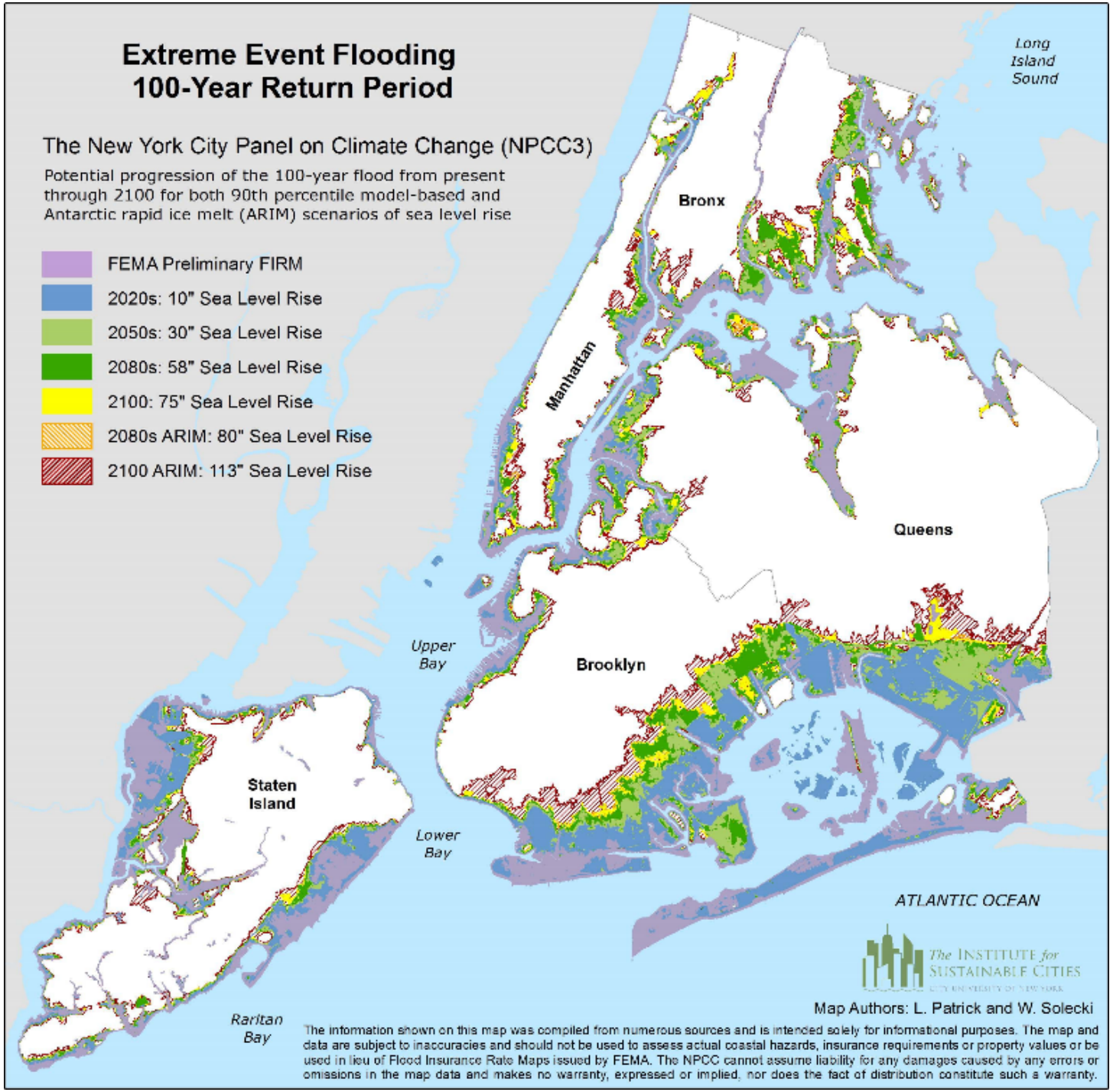
Hurricane Sandy Flood Extent and Inundation



~17% of New York City was covered by flood water



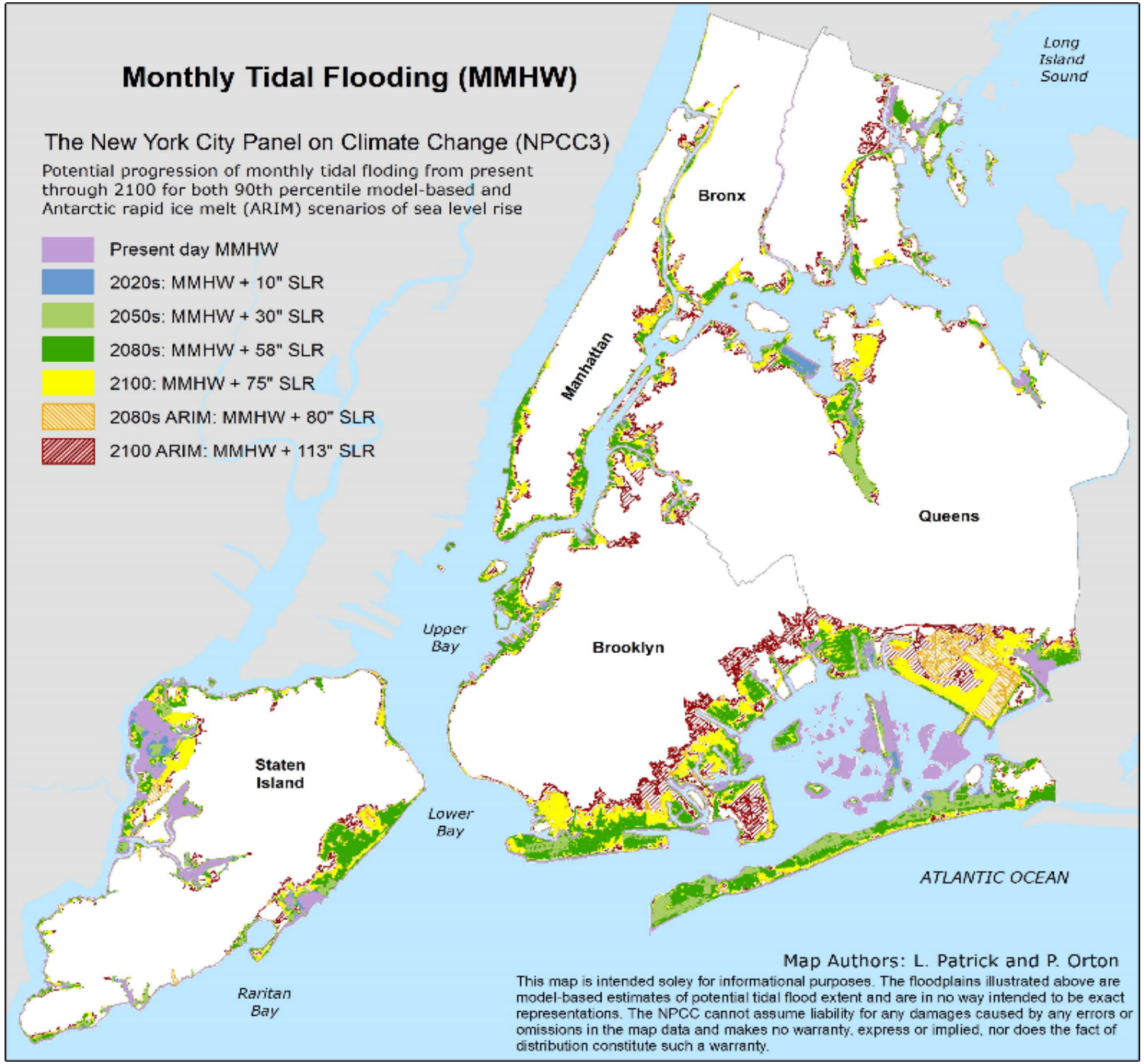
Growing potential for catastrophic flooding loss

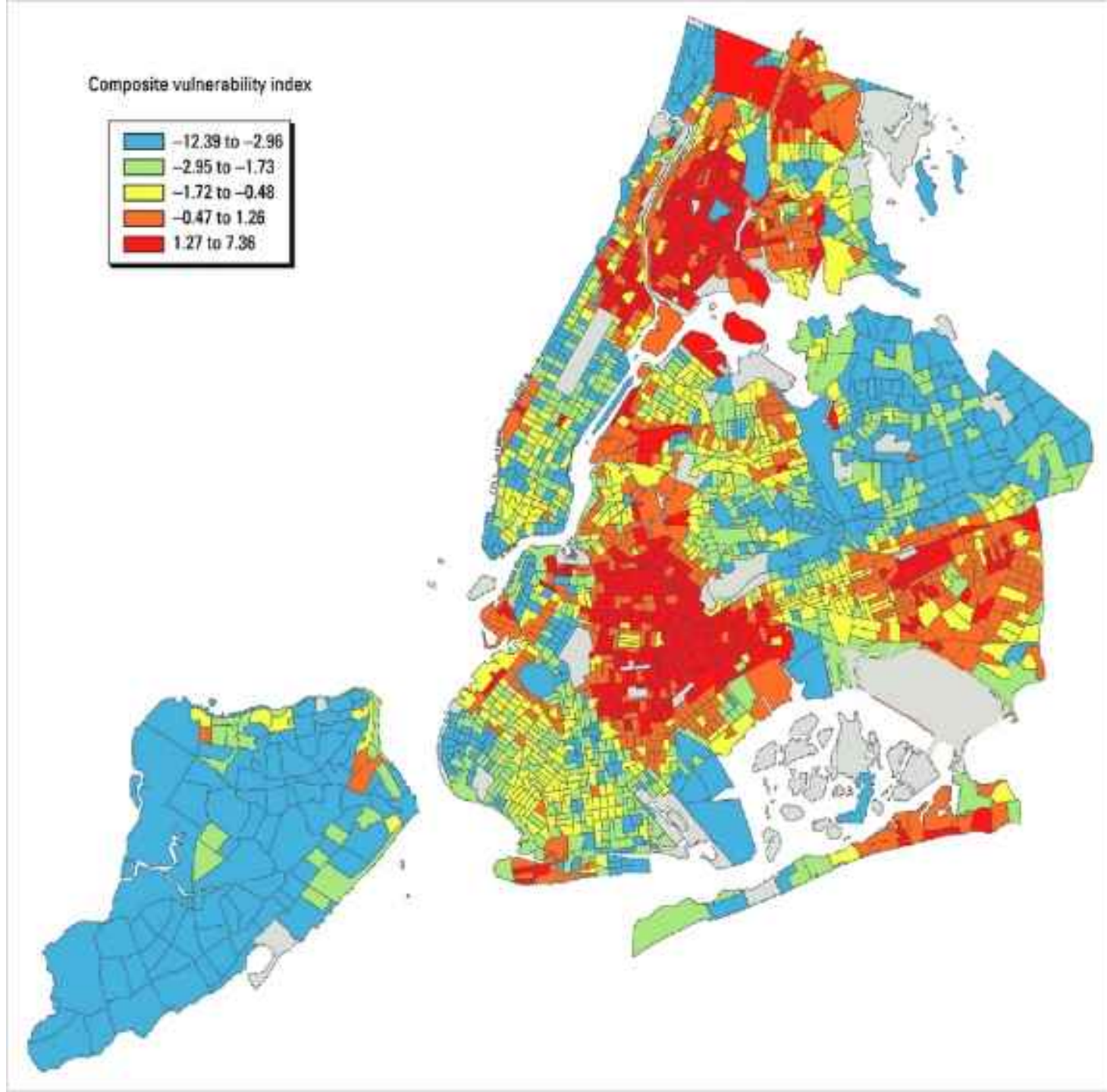


NPCC3 (2019) ARIM scenario is based on DeConto and Pollard (2016), Kopp et al. (2014; 2017) and informed expert judgments with regard to maximum plausible ice loss rates from Antarctica (see above and Sweet et al,. 2017).

Growth of nuisance, sunny day flooding –: Source - NPCC3 2019

Change in the Everyday and Place Affinity and Home –




Composite vulnerability index
−12.39 to −2.96
−2.95 to −1.73
−1.72 to −0.48
−0.47 to 1.26
1.27 to 7.36

Are we making progress in becoming more resilient to extreme events?

- Hard to answer definitively; a lot of money is being invested (~10 billion USD) but we lack a robust monitoring and evaluation mechanisms of these efforts.

- Vastly differential adaptation response – protecting Lower Manhattan

- Maladaptation concerns and inequity considerations hampering progress

- Hurricane Ida, Sept 2021

Demolishing a home flooded by Sandy

Hurricane Ida as a game changer

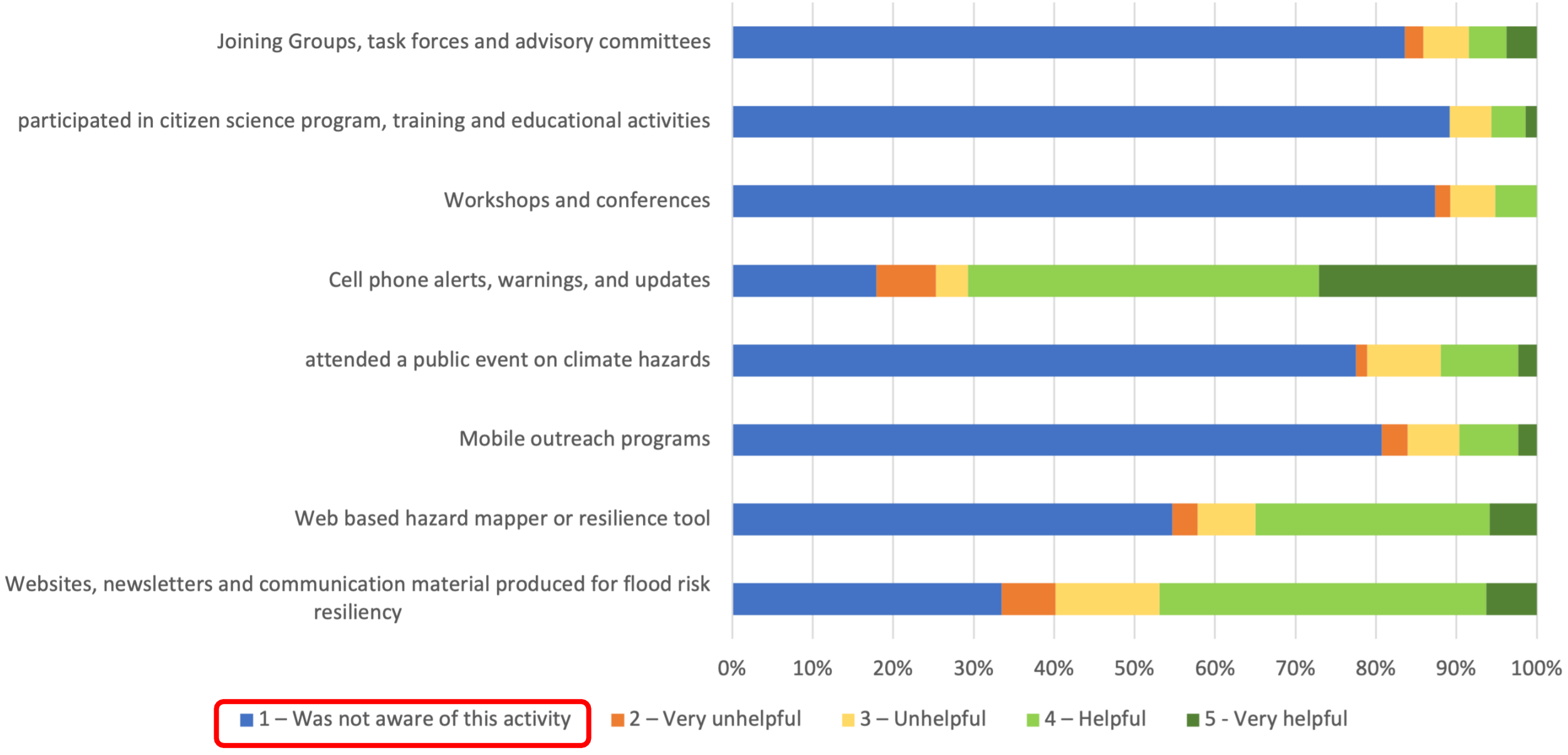
Emerging Limits of Urban Resilience Policy in NYC

- Increasing local opposition; green gentrification – climate gentrification
- Lack of trust, equity issues
- Policies not well articulated or communicated
- Lack of specific definitions and metrics including metrics of effectiveness
- Lack of resources
- Lack of understanding – science limits
- Lack of capacity to enable transformative changes in policy

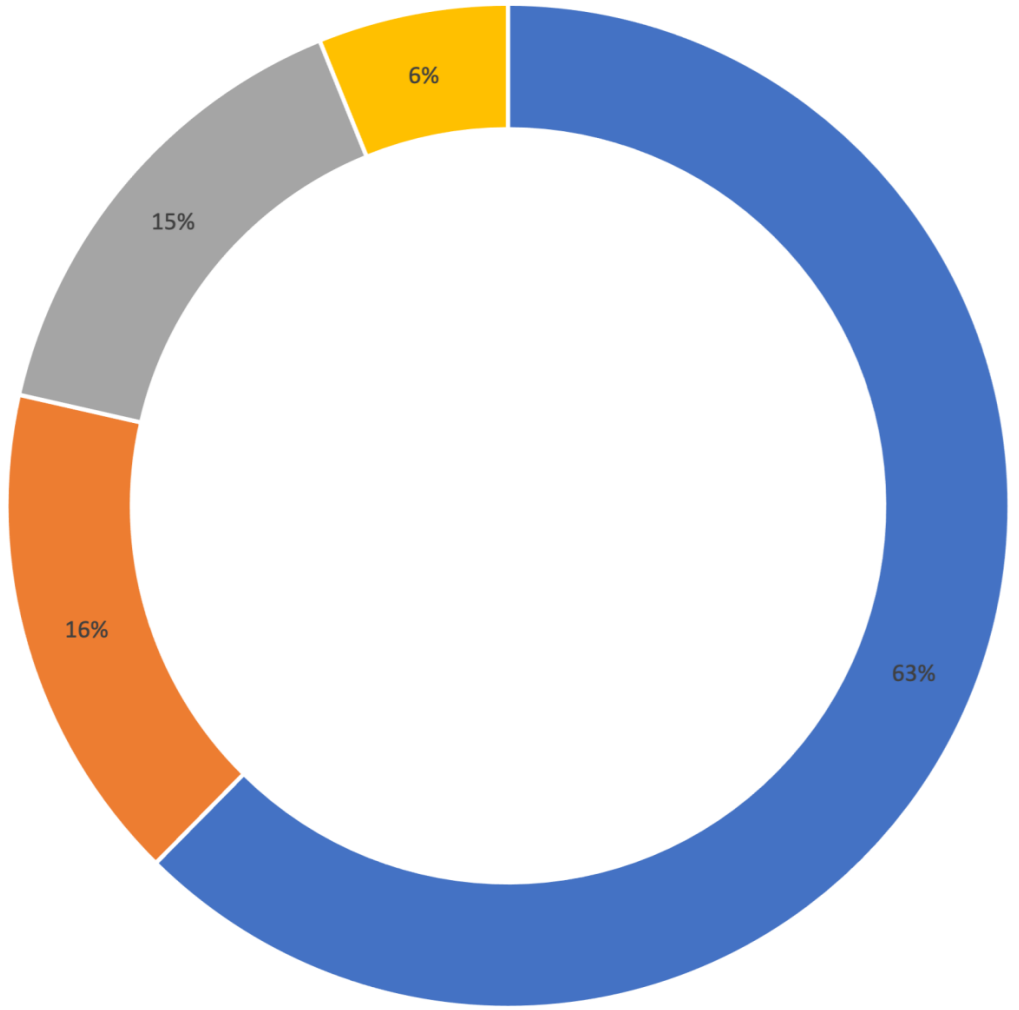
Red Hook, Brooklyn

Survey of household residents of six highly flood prone coastal communities – Communication and Engagement Limits

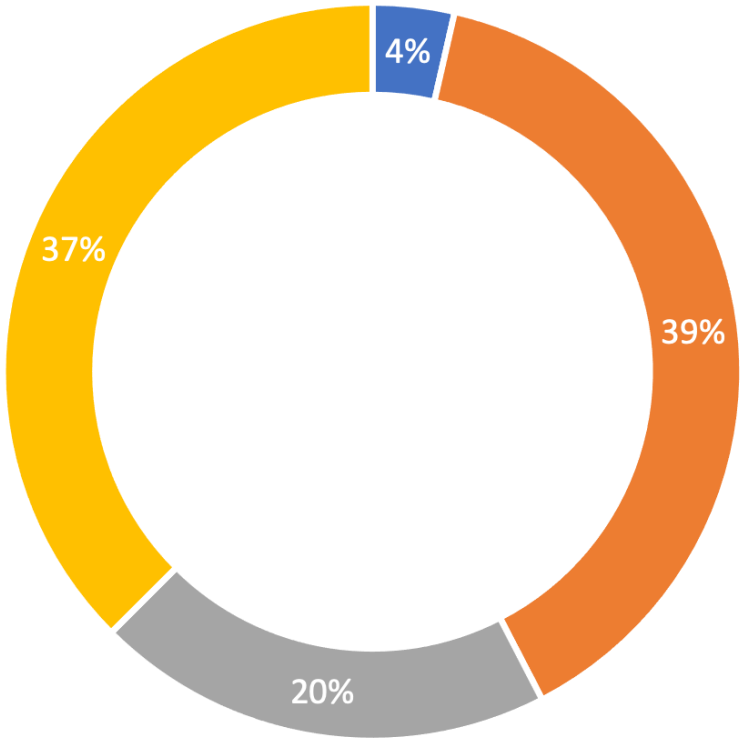
Q9-Which of the following government(municipal, county, state or federal)activities have you participated in and to what degree were they helpful?



Q12-To what extent do you feel that information provided by the current flood risk resiliency programs has influenced your own flood risk decision-making process?

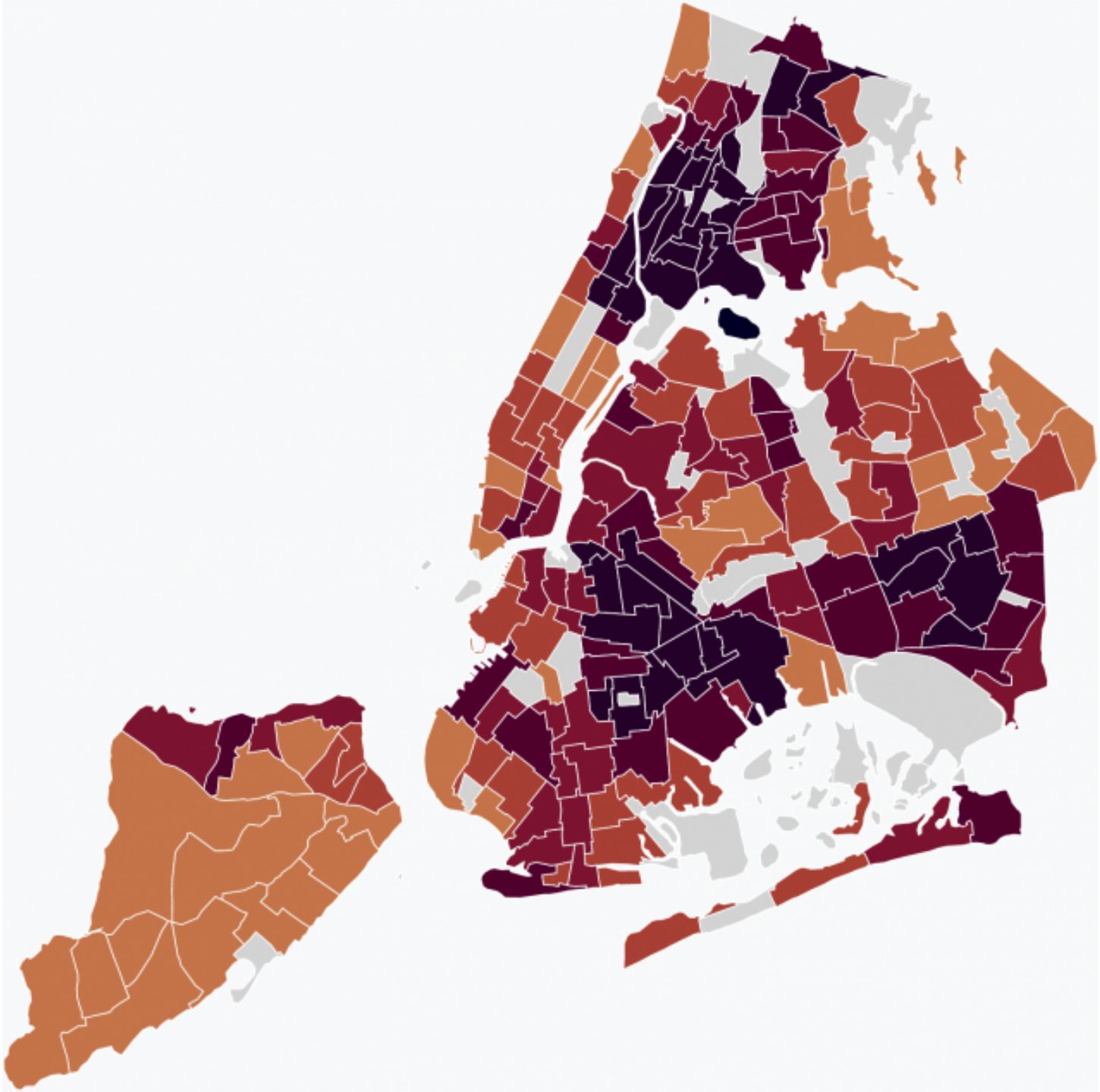


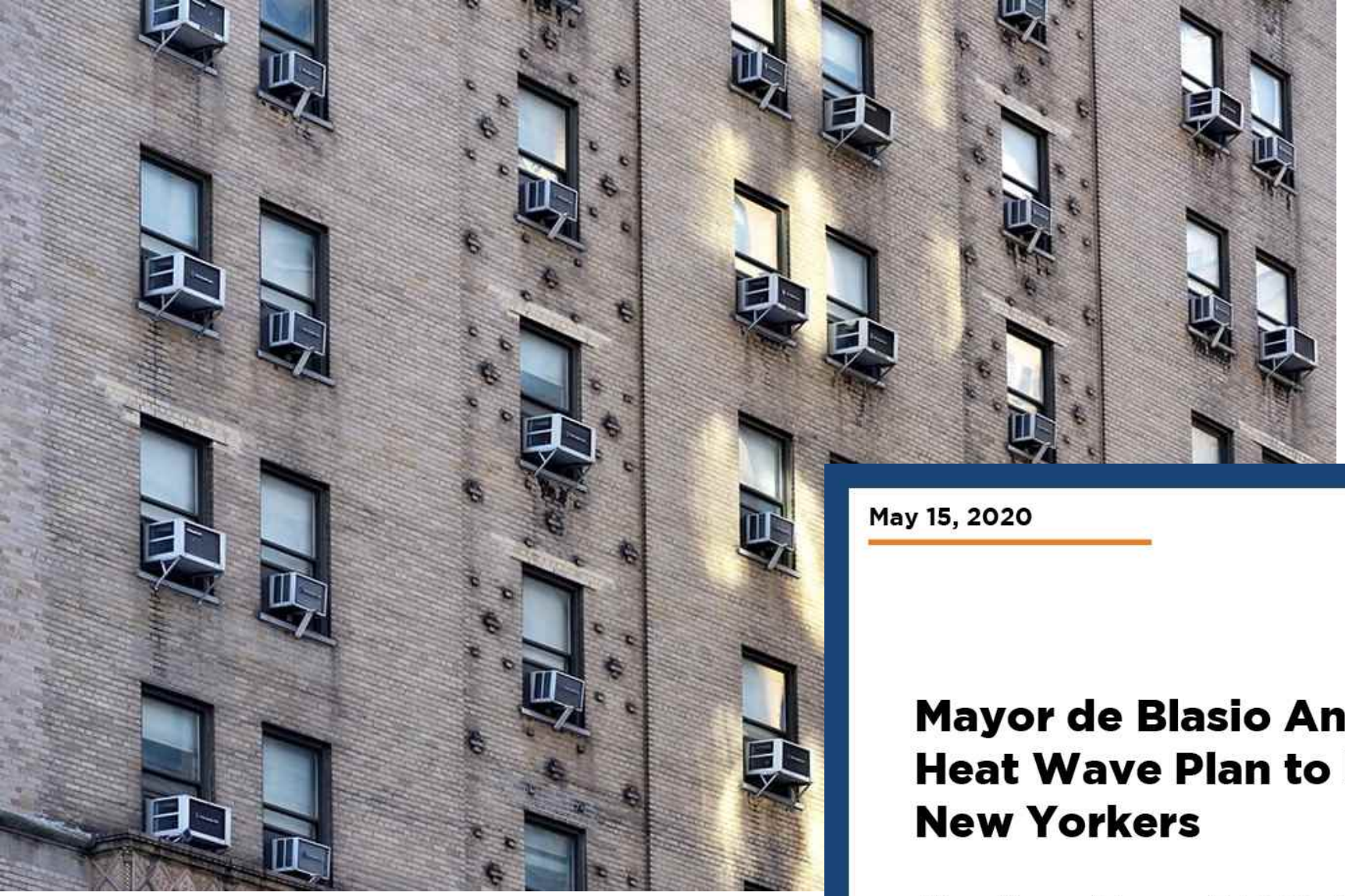
Q18-Chart How many Hurricane Sandy-level events do you think you would be willing to endure in the next decade before considering leaving your current home?



- I am already planning to move because there is too much risk
- Another storm like Hurricane Sandy within the next fie years would make me seriously consider moving
- Two storms like Sandy within the next ten years would make me seriously consider moving
- Don't know what would make me move but it would have to be more than two Hurricane Sandy type storms in the next decade

New York City Heat Vulnerability Index map. Darker colors indicate more vulnerable districts. Source: NYC Environment & Health Data Portal





Compound risk: COVID-19 and Extreme Heat Risk

May 15, 2020

Mayor de Blasio Announces COVID-19 Heat Wave Plan to Protect Vulnerable New Yorkers

City will provide over 74,000 air conditioners to low-income seniors and modify cooling centers for social distancing requirements; City urges Public Service Commission to provide further cooling assistance to vulnerable New Yorkers

Biggest Opportunities to make CRD work in NYC

- Significant science and knowledge base
- History of climate governance
- Engaged and developed community based organizations and civic society
- Crises as windows of opportunity to reflect on CRD requirements and demands

Biggest challenges on how to make CRD work in NYC

- Retrofitting and connecting existing administrative structure
  - Linking the agencies
  - Overcoming silos
  - Policy integration

- Engaging with communities
  - (Re-)Building trust with communities
  - Communication and information transfer
  - Income and social and environmental equity gaps

- Size and scope of requirements
  - Critical infrastructure re-investment
  - Short vs. long term risk (immediate risk vs. existential risk)
  - Tightly coupled system – narrow window of safe-fail

Conclusions – Climate Resilient Development in Cities

- Cities provide excellent study sites to experiment with CRD
- One can build upon the institutional and cultural capacity of cities as sites of innovation and implementation
- Limited by the constraints of financial resources, inequities, range of other immediate demands (including short term climate action demands), lack of engagement or communication strategies to reach residents with new initiatives.
- Need another wave of research to understand the system level interactions between adaptation, mitigation, and sustainable development; need case study research
- Important to incorporate CRD best practices into national and international city networks to accelerate progress.
- Climate risk is increasingly dynamic requiring more flexible and adaptive policies.
- How to create an explicit recognition of different roles in CRD and how to a social contract that could promote more rapid movement toward CRD. How to reconcile the individual and the collective; the agency specific and inter-agency action
- Lingering question – is CRD a new paradigm that requires transformative change, or a way to merge and interconnect currently disparate policies (i.e., make holes in silos), or is it context specific and combination of both?

Thank you

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