

Decision Support Models for Sustainability: Science-Policy Linkages in Urban Settings

William Solecki

Transition toward Sustainability after 15 Years:

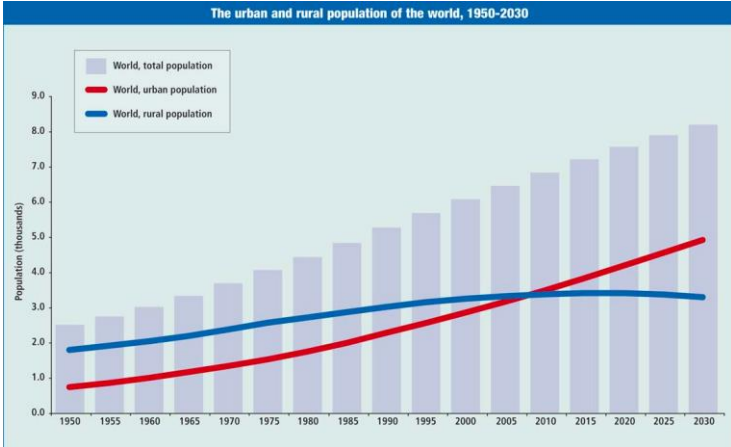
Where Do We Stand in Advancing the Scientific Foundation? A Workshop

January 14-15, 2016

National Academies of Sciences



The urban and rural population of the world, 1950-2030



Context for Science-Policy Linkages –
Cities have emerged on the national
and international policy agenda



UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan



UNITED NATIONS
SUSTAINABLE
DEVELOPMENT
SUMMIT 2015
25 - 27 SEPTEMBER



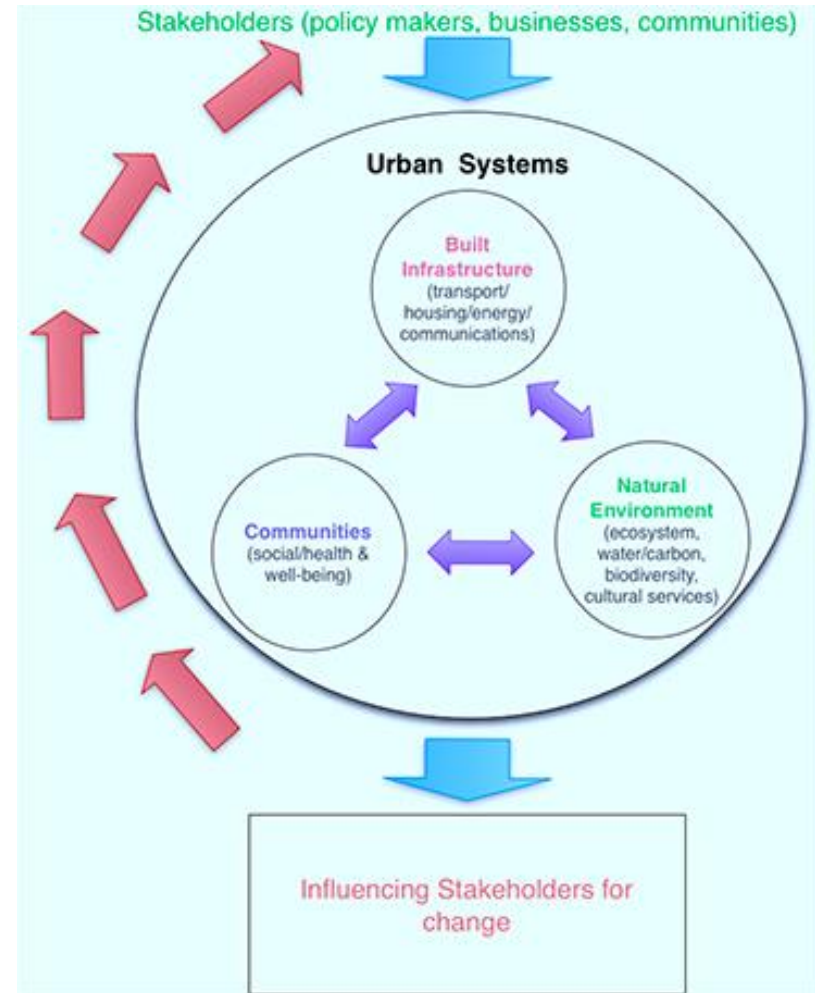
COP21-CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE



H III
HABITAT III
QUITO - OCTOBER 2016
United Nations Conference on Housing
and Sustainable Urban Development

Translating the Science to the Urban: Recent Developments

- Conceptualization and operationalization of urban systems; global teleconnections; urbanization (urban) science
- Uncertainty and likelihood statements – National Climate Assessment, IPCC
- Multiple forms of knowledge – expert, local, empirical, qualitative
- Measurement; micro and macro sensing
- Indicators and monitoring of change
- Community organizations; boundary organizations
- Open and transparent process
- Co-production of knowledge

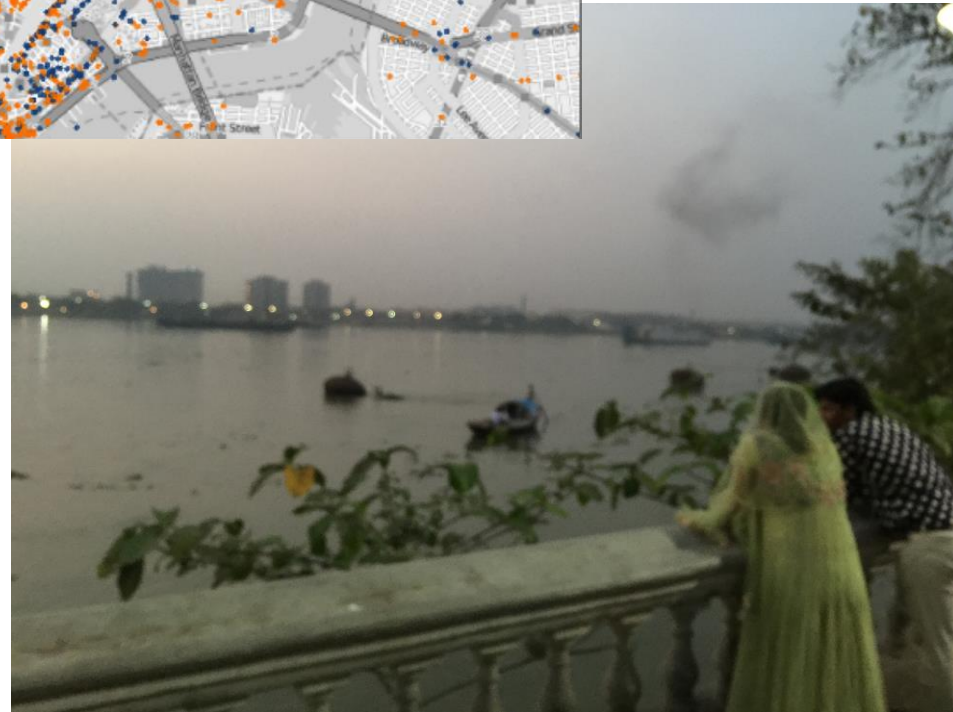


Computational Models for Urban Decision-Making

- **Models of urban systems still limited**
 - Building on existing engineered – built environmental system model
 - Advances in physical systems
 - Some advances in ecological systems (esp. ecosystem services)
 - Very limited for social systems
 - Limited integrated modeling for the urban realm and scale
- **Challenges**
 - Lack of data key limitation
 - Lack of capacity to operationalize urban system analysis
 - Lack of basic science and expertise
 - Lack of financial resources
 - Lack of trust of products
- **Some exceptions** – some EU countries, China and a few others use integrated modeling for urban spatial planning



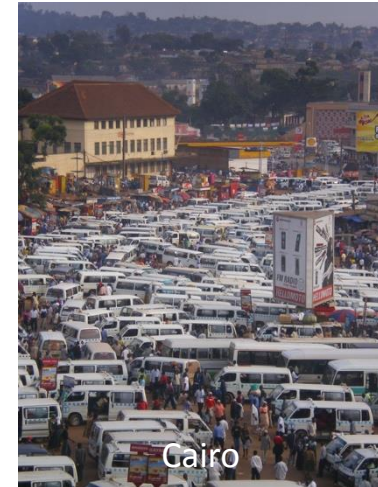
Taxi trips in Manhattan on May 1, 2013 from 8 a.m. to 9 a.m. The blue dots correspond to pickups and the orange ones correspond to drop-offs.



Hooghly River, Kolkata

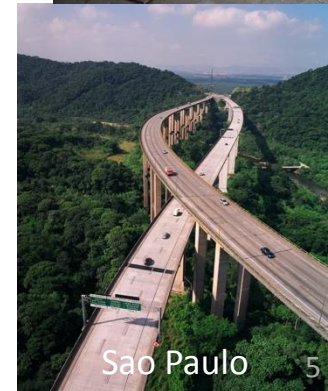
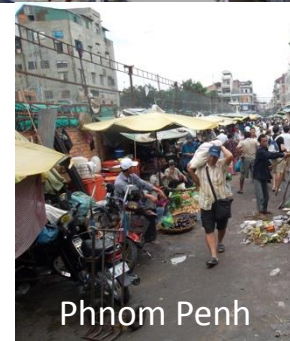
City Leaders are at the Right Level of Governance to Take Sustainability Action

- Understand **systems, risks, exposures, and vulnerabilities**
- Forging links with **local academic and research communities**
- More direct **contact with constituents**
- Involved in **day-to-day management**; more practical
- Able to form **coordination networks** with other cities

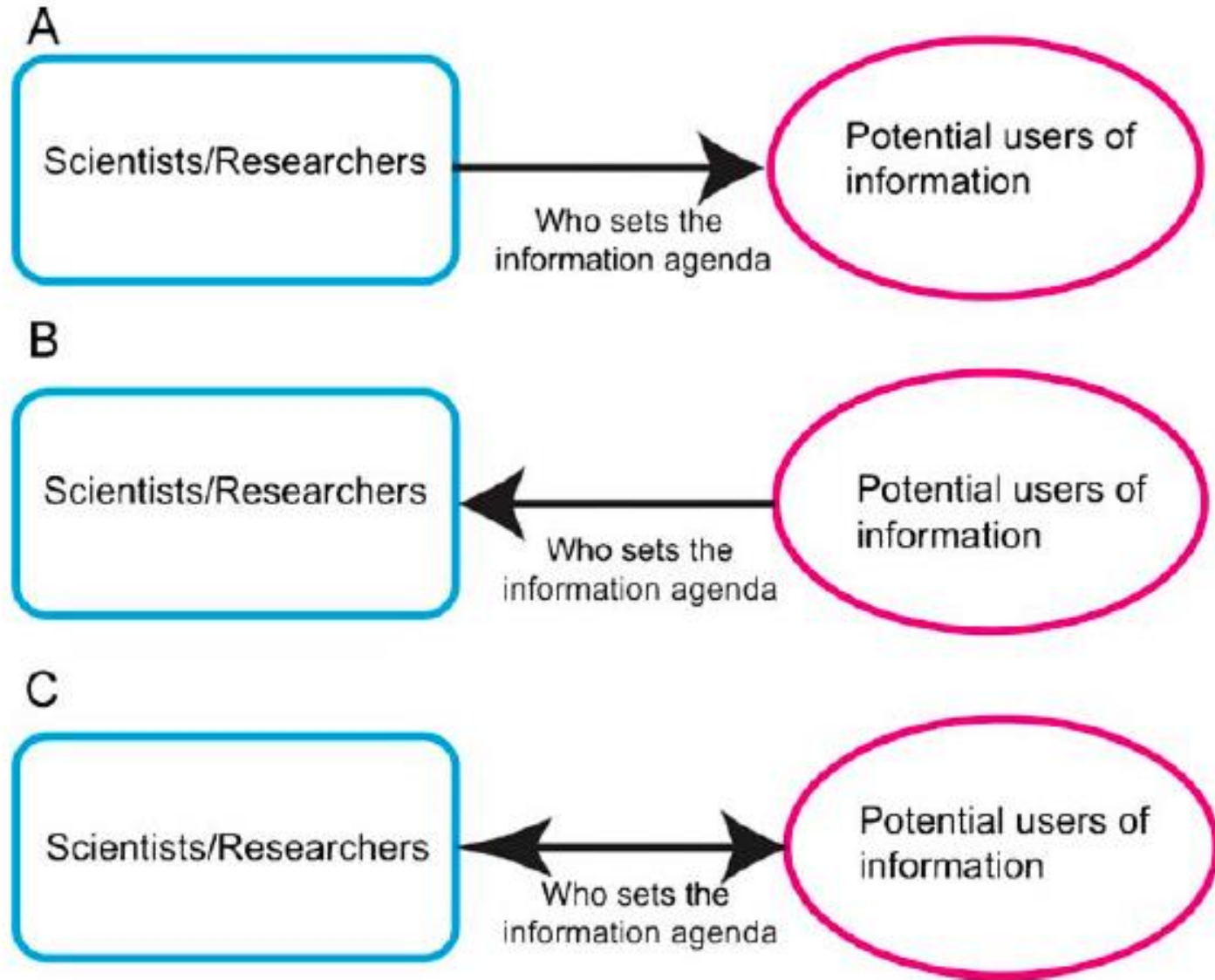


However, there remain **many challenges**:

- **Multiple jurisdictions – metropolitan scale**
- **Financing** mitigation and adaptation measures
- **Uptake** (within and across cities)
- **Moving beyond higher income, large cities**
- Maintaining **momentum** across election cycles



Types of Science-Policy Linkages



Co-Production of Knowledge

“the collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems-oriented understanding of that problem” Armitage et al. 2011

Key Phases of Co-Production

- Joint problem-framing
- Integration in knowledge production and joint knowledge dissemination
- Collaborative experimenting and learning

Key Issues

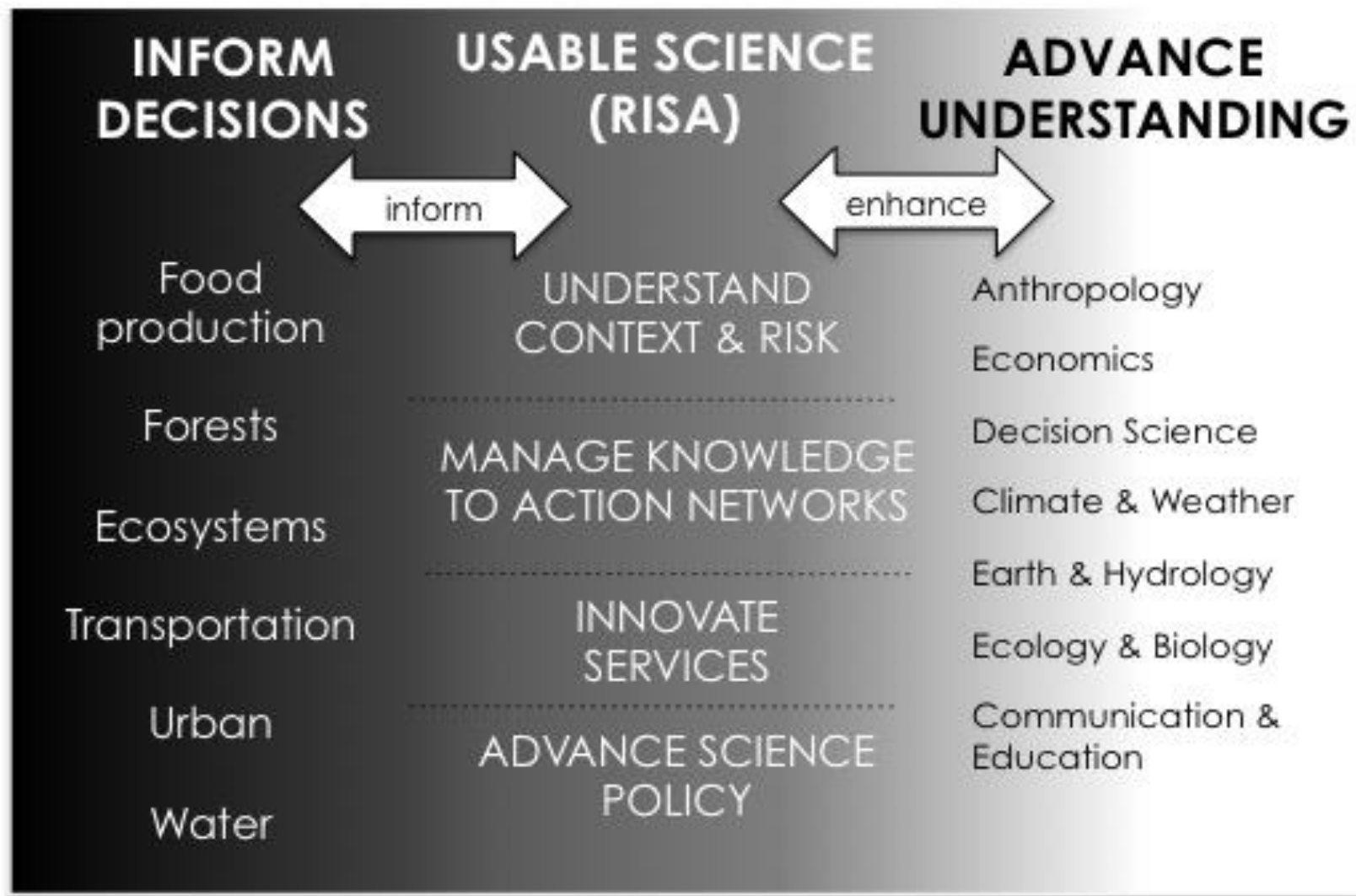
- Participants - Who is at the table? Who is not?
- Position – expertise and power?
- Incentives – benefits and costs to participants and other stakeholders
- Arrangements and approach – experiments, sensing, relationships across groups and participants, sustaining process
- Outcomes – measurement, indicators, value

Co-Design and Co-Production of Knowledge



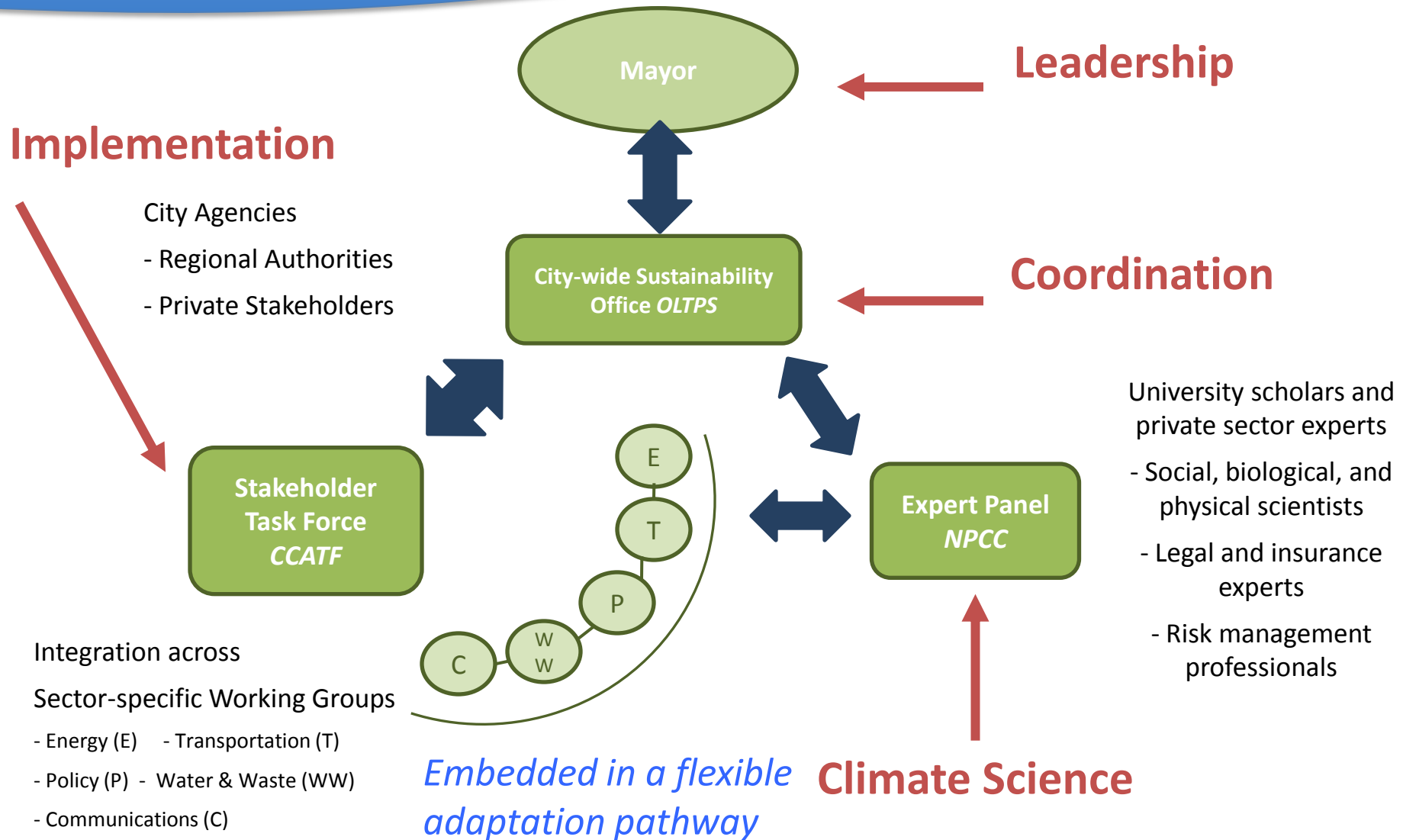
Examples of Science-Policy Linkages – Models in Practice

NOAA – Regional Integrated Systems



Parris, A., G. Garfin, K. Dow, R. Meyer, and S.L. Close, (Eds.). Climate in Context: Science and Society Partnering for Adaptation. London: John Wiley & Sons. In Press.

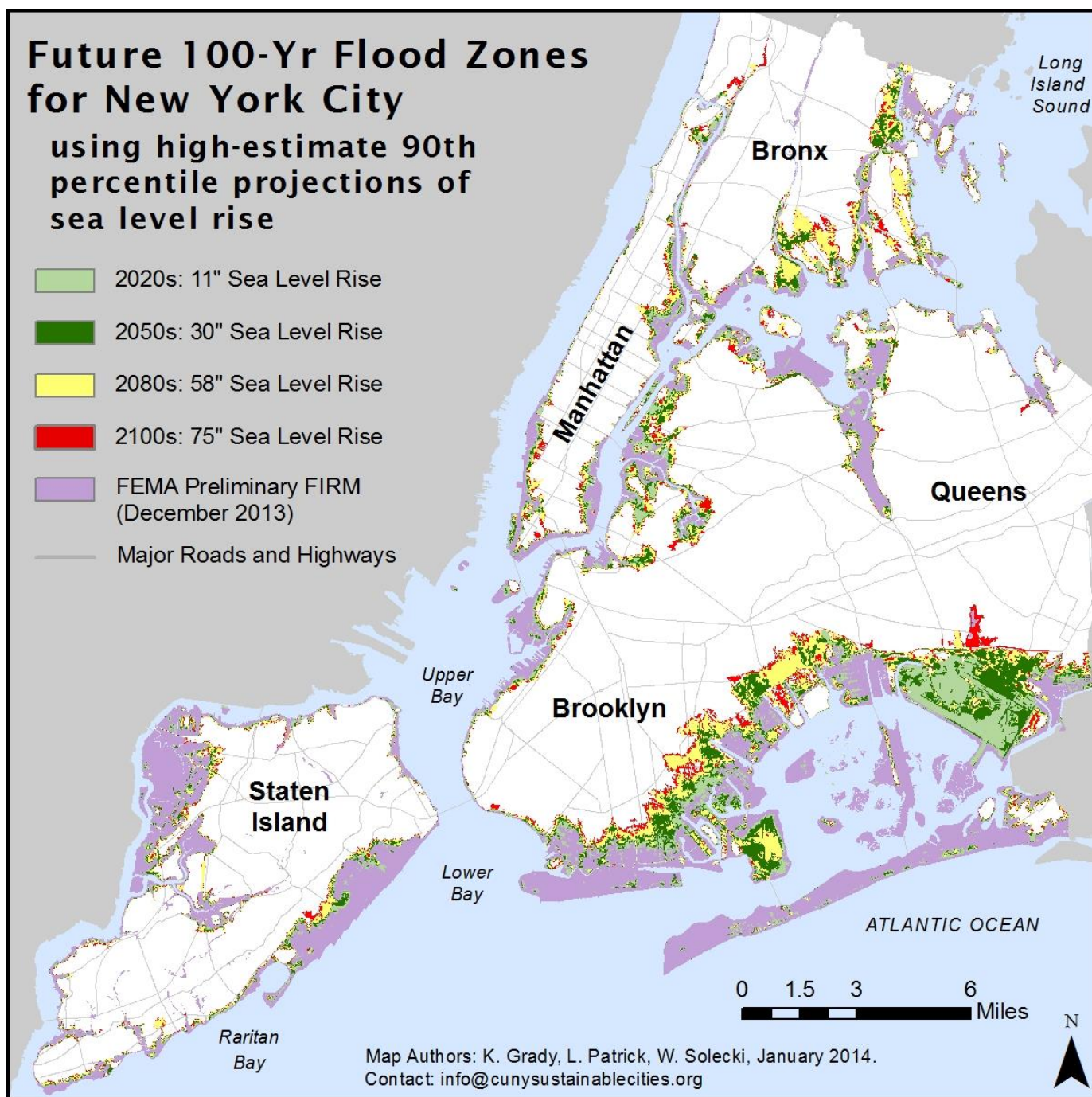
New York City Adaptation Process



Future 100-Yr Flood Zones for New York City

using high-estimate 90th
percentile projections of
sea level rise

- 2020s: 11" Sea Level Rise
- 2050s: 30" Sea Level Rise
- 2080s: 58" Sea Level Rise
- 2100s: 75" Sea Level Rise
- FEMA Preliminary FIRM (December 2013)
- Major Roads and Highways



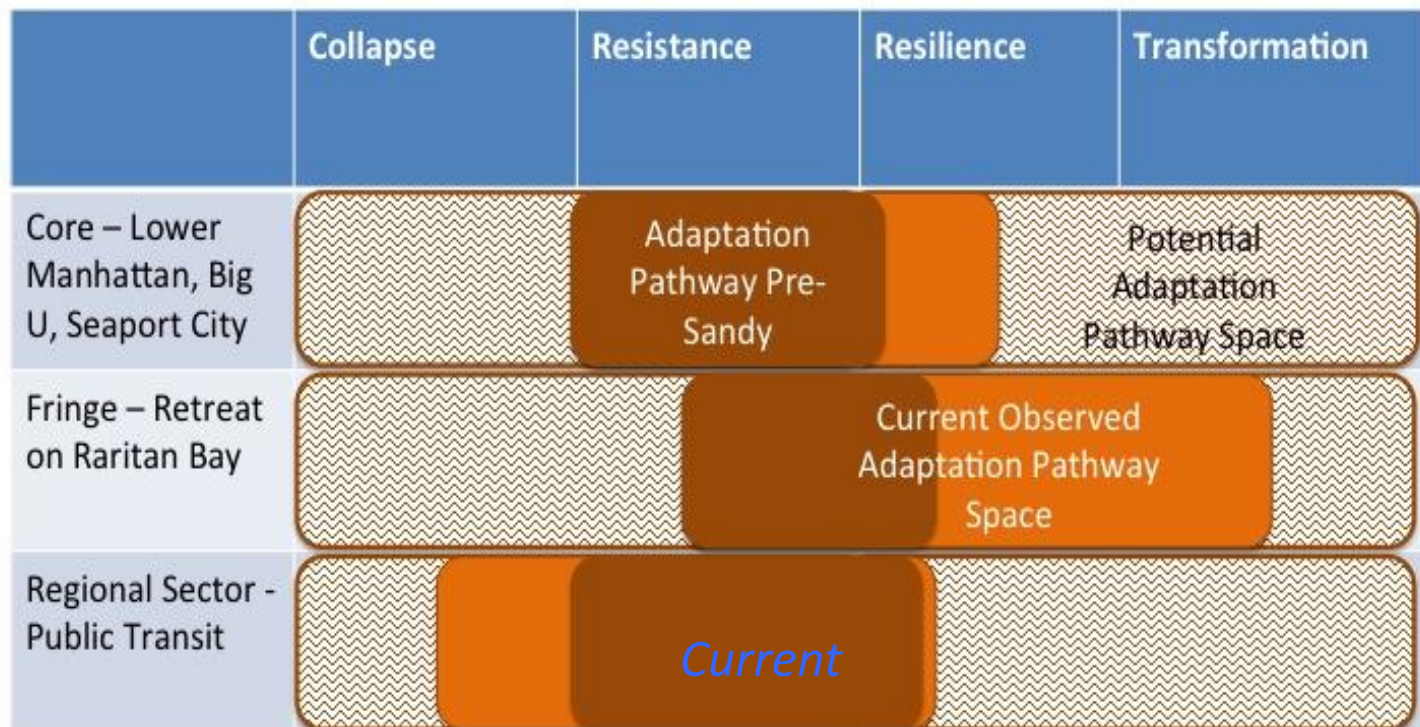
A co-generated
product from
the CCATF, NYC,
and NPCC

Map Authors: K. Grady, L. Patrick, W. Solecki, January 2014.
Contact: info@cunysustainablecities.org

Source: New York City Panel on Climate Change (2015)

Transformation and Resilience of the Urban Coast (TRUC) Project – funded by Belmont Forum

New York City Case Examples and Adaptation Pathways Observed and Potential* Analysis Space



*Observed empirical adaptation pathways can be derived from the case study data; understanding of potential adaptation pathways will be derived from the modeling, scenario work, and face-to-face discussions with local stakeholders

Science and Resilience Institute @ Jamaica Bay

Knowledge cultures as a nested system (Brown 2001)

Culture and content

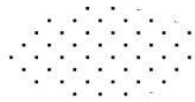
Key

Nested knowledges

INDIVIDUAL KNOWLEDGE

Own lived experience, lifestyle choices, learning style, identity

Content: reflections, learning



LOCAL KNOWLEDGE

Shared lived experience of individuals, families, businesses, communities

Content: stories, events, histories



SPECIALISED KNOWLEDGE

Environment and Health Sciences, Engineering, Law, Philosophy, etc

Content: case studies, experiments



ORGANISATIONAL KNOWLEDGE

Organisational governance, policy, strategies

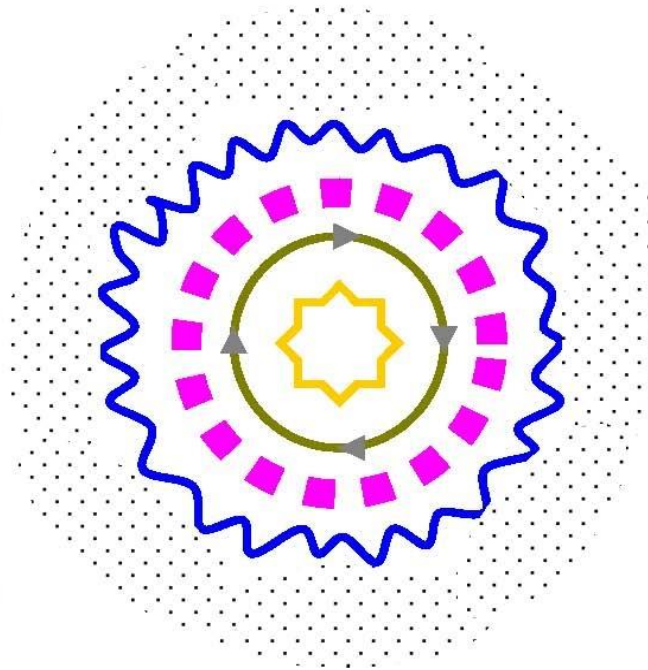
Content: agendas, alliances, plans



HOLISTIC KNOWLEDGE

Core of the matter, vision of the future, a common purpose

Content: symbol, vision, ideal



Science & Resilience Institute at Jamaica Bay

A Global-to-Local Partnership for Resilience

RESILIENCE
THEORY

*Boundary
Organization
Science – Policy
Linkage Baked In*

PARTNERS

City of New York National Parks Service

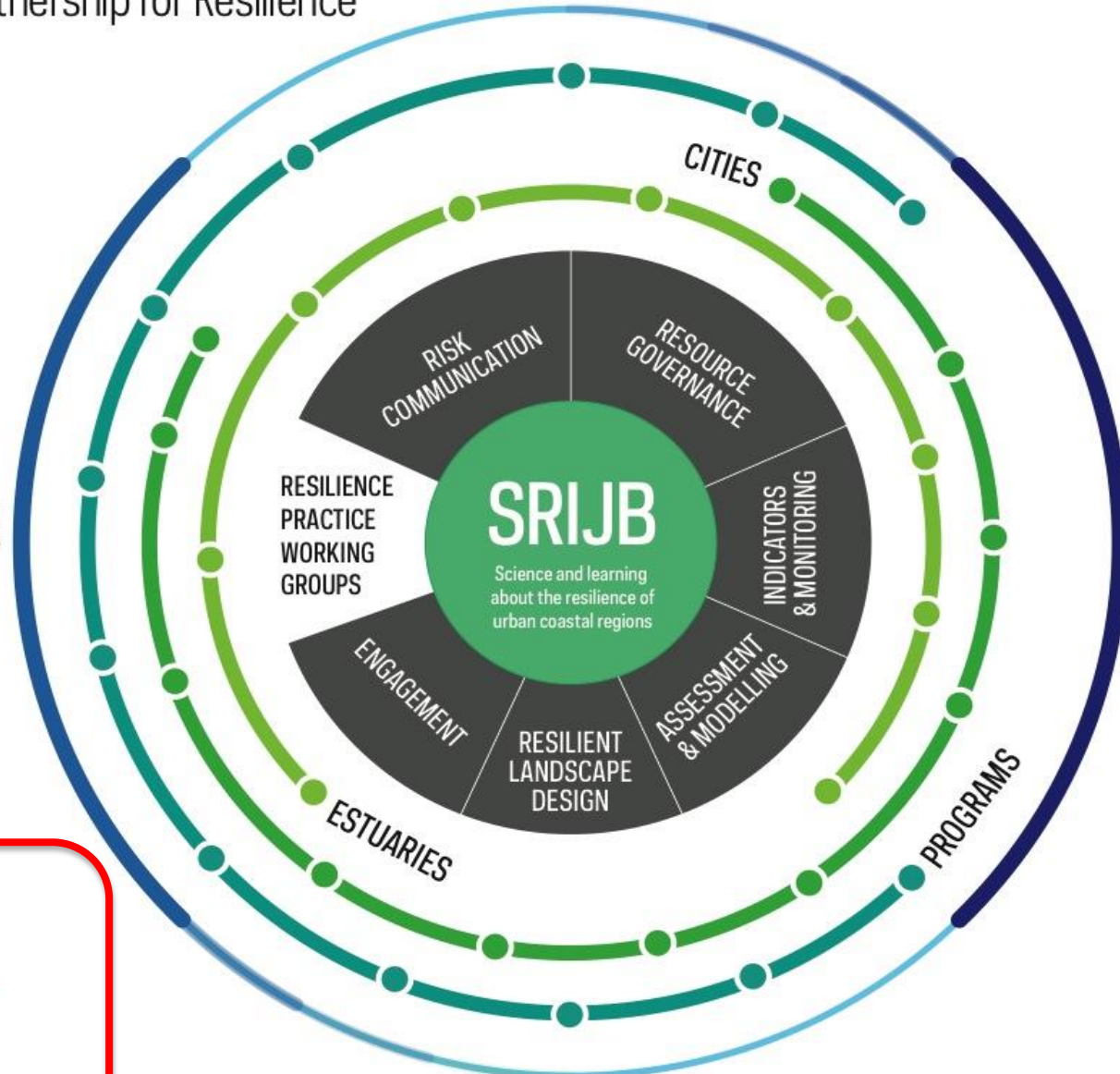
City University of New York Columbia University

Cornell University Rutgers University

NASA Goddard Institute for Space Studies

New York Sea Grant Stevens Institute of Technology

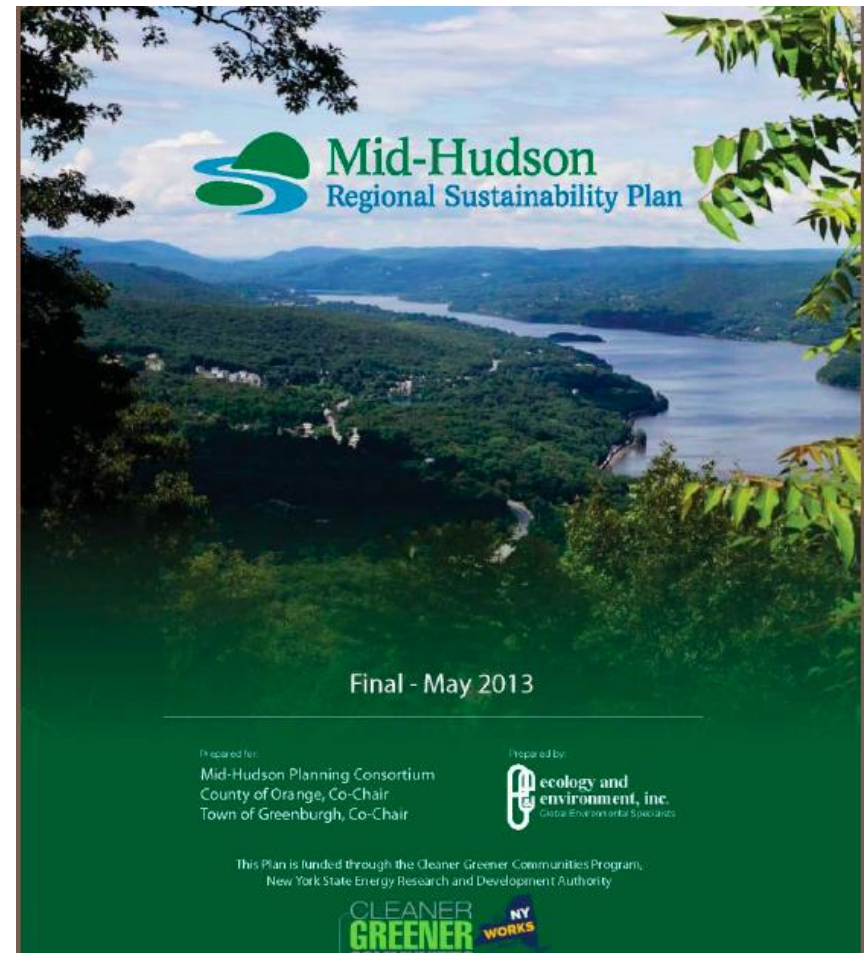
Stony Brook University (SUNY) Wildlife Conservation Society



Nested scales are important for science and for decision making

Sustainability Orange (County) – Suburban/Exurban New York State

- Several \$400k project to translate indicators into measurements
- Well developed measures complete with specific instructions
 - Sustainability Indicators
 - Objectives
 - Initiatives for Implementation
 - Implication Strategies
 - Range of empirical measures
 - Methods for deriving empirical measures
 - Specific protocol for defining measure by Orange County planning staff
- The process becomes so elongated that the co-production process becomes splintered.



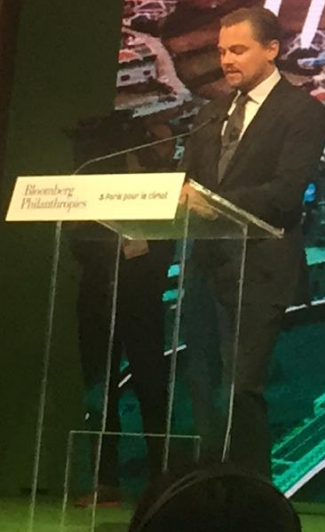
City Networks (C40 and Iclei) at COP21 – Paris Dec. 2015



Another model: Science without Scientists – Peer to peer learning

Or via charismatic megafauna...Oscar nominee

WHAT IS THE TRANSFORMATION IMPERATIVE?



à Paris pour le climat

Bloomberg
Philanthropies

Bloomberg
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LES VILLES POUR LE CLIMAT



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LES VILLES POUR LE CLIMAT

Concluding Thoughts

- Significant movement to the development of policy relevant (not necessarily policy prescriptive) research
- Movement from supply side to demand driven research – on time research; away from “over the wall” research
- Collaborative – co-generation knowledge current edge
- Challenges for process - power relations still dominate, legal constraints – who has authority to act and what are the economic benefits and costs of action, time intensive – stakeholder fatigue, many still feel excluded
- Challenges for science community – loss of the cutting edge – loss of outside the box thinking, loss of gray science for black and white, getting too close to power



Landscape with the Fall of Icarus –

P. Bruegel the Elder

Thank you

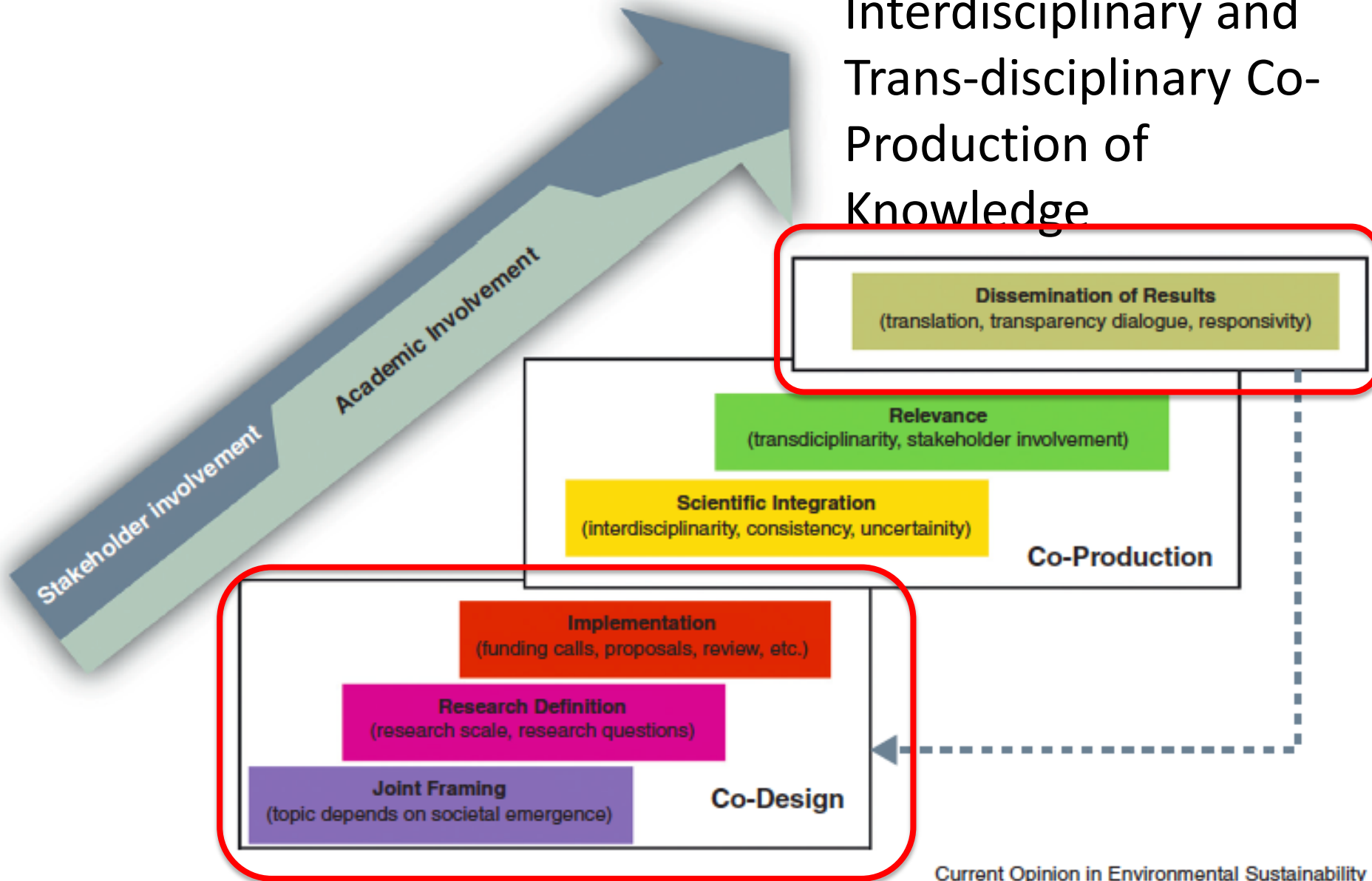
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Framework for Interdisciplinary and Trans-disciplinary Co- Production of Knowledge



Approaches to Collaboration Categorized by the Mode(s) of Engagement

Approach to deliberate coproduction	Mode(s)	Type of question	Role of research team	Resources required
Action research	Collegial	<ul style="list-style-type: none"> • Stakeholder defined • Effecting change for stakeholder • Social/environmental justice focus 	<ul style="list-style-type: none"> • Facilitators, teachers, technical guidance • Support the research of the stakeholder community 	<ul style="list-style-type: none"> • Sufficient time to spend in stakeholder community • Financial (or other) support for stakeholder participants
Transdisciplinarity	Collegial	<ul style="list-style-type: none"> • Technical question that also has complex political or social impacts 	<ul style="list-style-type: none"> • Equal partners with stakeholders • Facilitators of the process 	<ul style="list-style-type: none"> • Sufficient time to spend on participatory activities
Rapid assessment process	Consultative Collaborative	<ul style="list-style-type: none"> • Understanding how stakeholders frame an issue; what terms and knowledge systems they use to understand the issue 	<ul style="list-style-type: none"> • Ethnographers—learning about stakeholders' context • Proposing solutions to address issue of concern. 	<ul style="list-style-type: none"> • Social science research training • Travel funds to go to stakeholder community/organization
Participatory integrated assessment	Consultative Collaborative Collegial	<ul style="list-style-type: none"> • Scenario planning • Development of integrated models 	<ul style="list-style-type: none"> • Facilitators of participatory processes • Provide technical input 	<ul style="list-style-type: none"> • Sufficient time to spend on participatory activities • Sufficient funds to engage in participatory activities
Boundary organizations	Consultative Collaborative Collegial	<ul style="list-style-type: none"> • Any of the above 	<ul style="list-style-type: none"> • Purveyors of salient, credible, legitimate science 	<ul style="list-style-type: none"> • Sufficient time to spend on participatory activities • Sufficient funds support boundary organization work