

# Climate Adaptation Experiments in the Urban Northeastern U.S.



*Boston*



*New York*

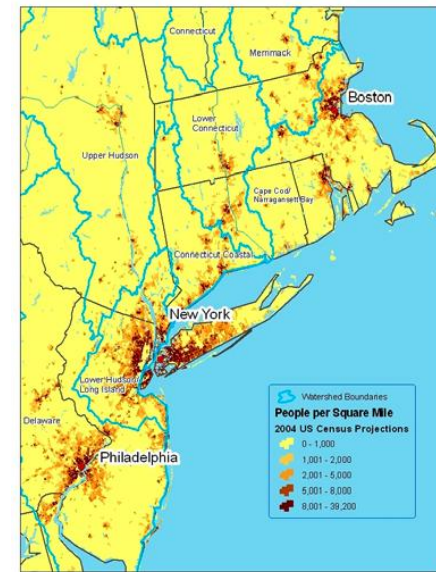


*Philadelphia*

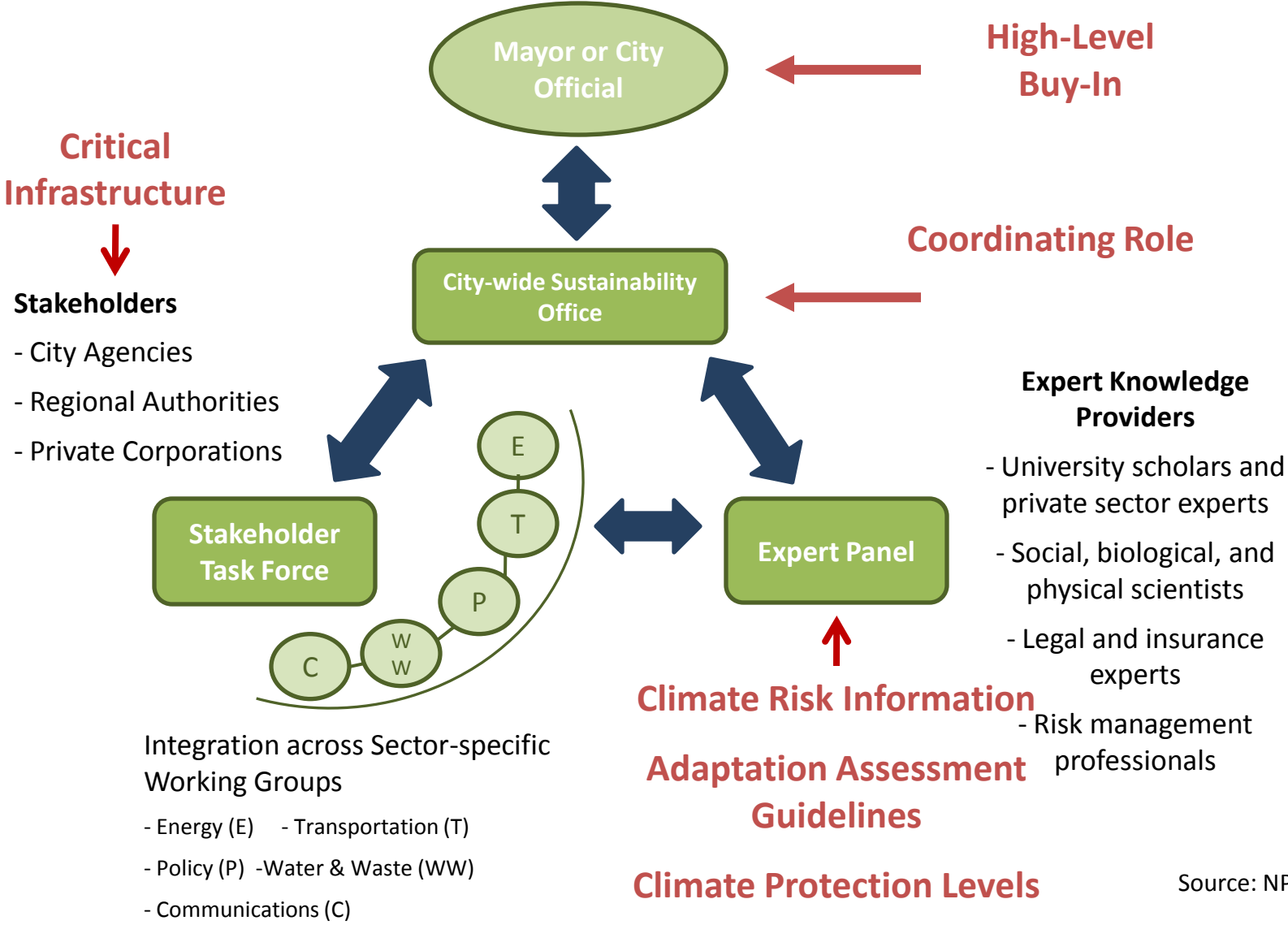
© 2009, J. Britton (Drexel)



Radley Horton  
Columbia University  
City Hall Sustainability Symposium  
Paris, France, October 24, 2012



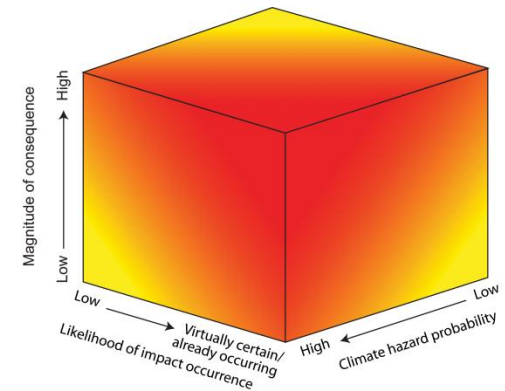
# New York City Adaptation Process



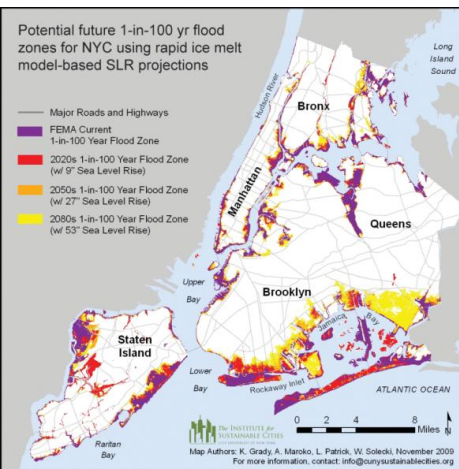
Source: NPCC, 2010

# Adaptation Assessment

- Climate scenarios developed for New York City were used to identify impacts on infrastructure and start the adaptation assessment process
- Climate information helped guide stakeholders through:
  - Inventory of At-risk Infrastructure
  - Risk Assessment Matrix
  - Strategy Prioritization Framework



|        |  |
|--------|--|
| RED    | Risks for which adaptation strategies should be developed.   |
| ORANGE | Risks for which adaptation strategies may need to be developed or for which further information is needed. |
| YELLOW | Risks for which impacts should be monitored but which may not need actions at this time.                   |



# Adaptation Decisions

- **Actions**

- Enhance existing programs
- Moving pumps at the Rockaway Wastewater Treatment Plant to 14 feet above sea level from 25 feet below

- **Planning**

- NYC DEP Climate Change Integrated Modeling Project (CCIMP) analyzing climate impacts on NYC water supply
- NYC DEP RFP to study impacts of rising sea level on Wastewater Pollution Control Plants (WPCP), tide gates and other structures

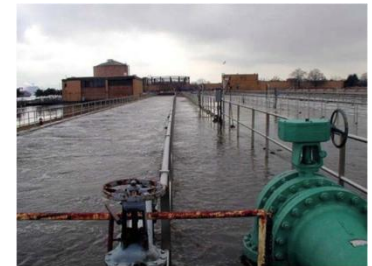
- **Standards and Regulations**

- NPCC Recommendation to change 1/100 year floodplain standards

- **Urban Design - MOMA**



Ashokan Reservoir, a component of the New York City Water Supply System



WPCP in Bronx, New York



# Adaptation Research Green Infrastructure



## Interventions

- Impervious surface removal efforts
- Stormwater diversion, storage, & use projects
- Urban natural landscape restoration efforts

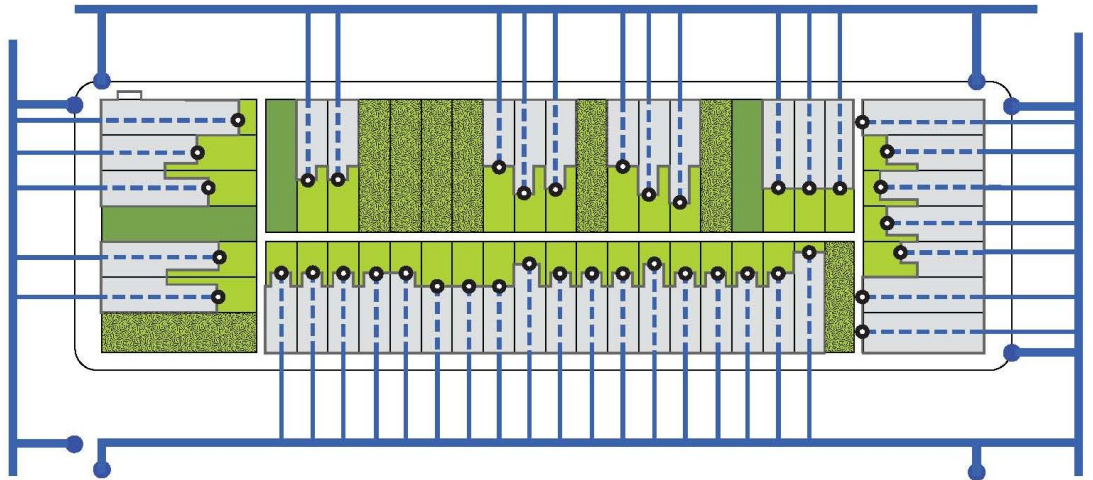


## Stakeholder interest

- Cost-effective means to manage urban watersheds and meet water-related infrastructure needs
- Contribution to urban sustainability goals

# Research Questions

- **Field studies** quantifying performance of different GI strategies under variable climate conditions (current & future)
- **Upscaling studies:** Assessing the impacts of widespread GI implementation at the urban scale

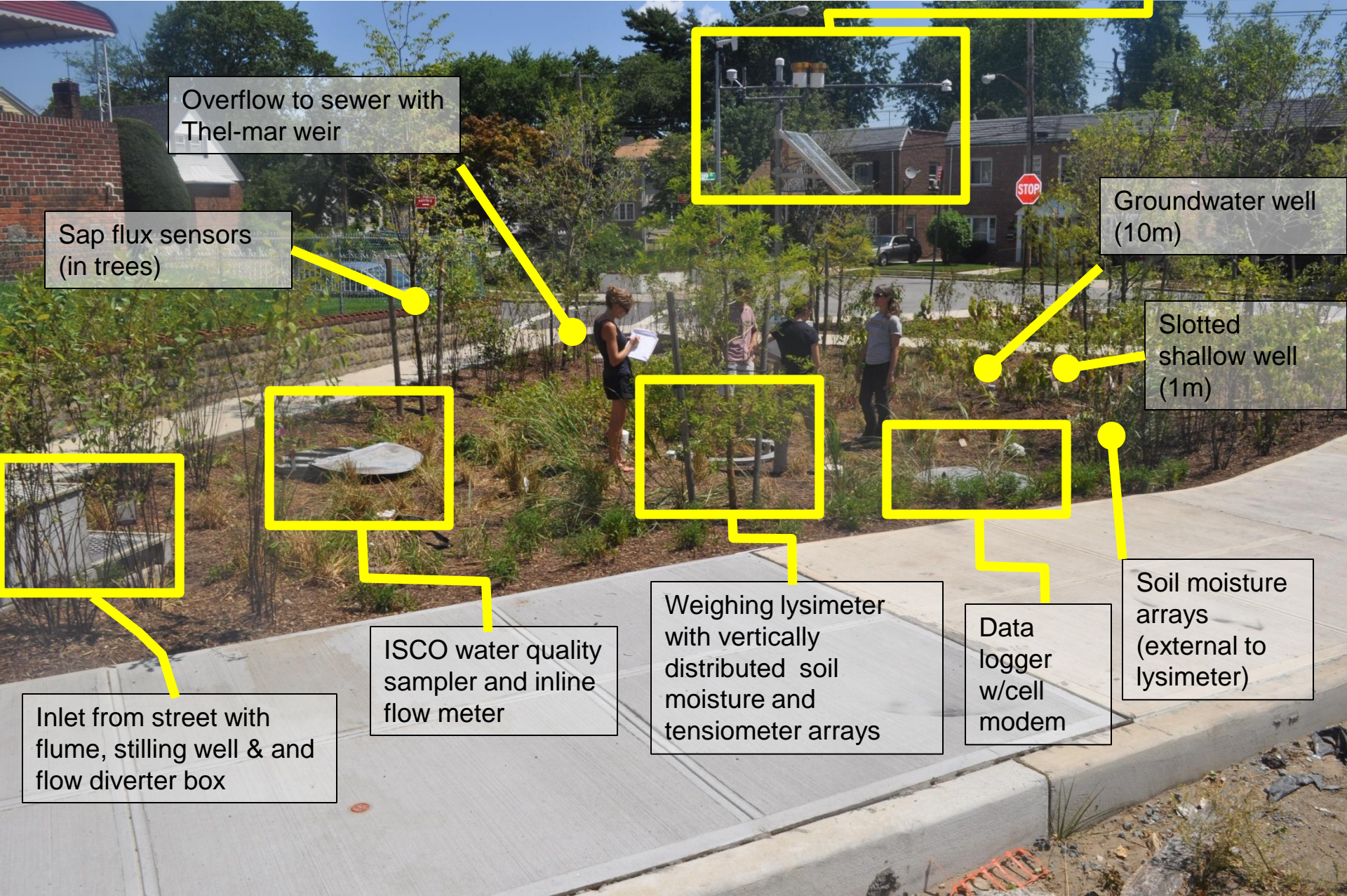


# Bioretention "Greenstreet" Monitoring Setup

Nashville & 116<sup>th</sup> Street, Queens, NY



Full climate station & solar power station



Overflow to sewer with Thel-mar weir

Sap flux sensors (in trees)

Full climate station & solar power station

Groundwater well (10m)

Slotted shallow well (1m)

Inlet from street with flume, stilling well & and flow diverter box

ISCO water quality sampler and inline flow meter

Weighing lysimeter with vertically distributed soil moisture and tensiometer arrays

Data logger w/cell modem

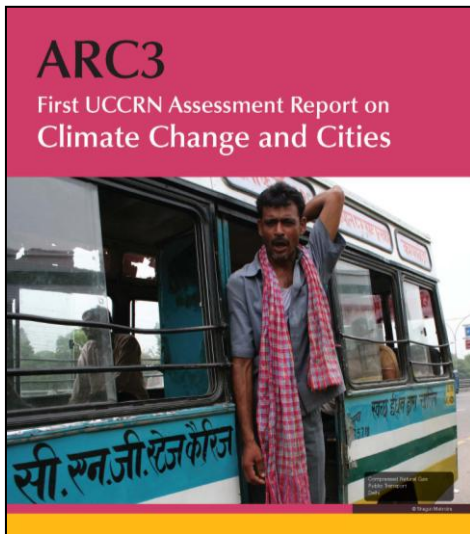
Soil moisture arrays (external to lysimeter)



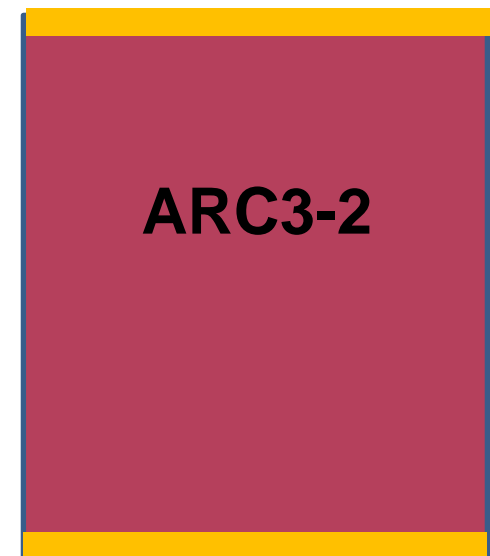
# CITIES AS FIRST RESPONDERS TO CLIMATE CHANGE: KEY ISSUES FOR THE UCCRN ARC3-2

## Goals:

- To **establish on-going, city-centered state-of-knowledge reports** for urban decision-makers
- To help **build sustainability and capacity for action**



Cambridge University Press, 2011  
Over 100 authors from ~50 cities







# FIRST ARC3



## Vulnerability

Framework for vulnerability assessment applied to four diverse cities:  
Buenos Aires, Delhi, Lagos, New York City.



## Climate Hazards

City-specific hazard assessment using observed and projected data on  
temperature, precipitation, and sea level rise.



## Energy

How climate change affects urban energy systems, especially surge in peak  
load demand, and mechanisms to mitigate and adapt.



## Water and Wastewater

Linking climate change with water systems in the cities across the globe with a  
focus on formal and informal water supply and sanitation services.



## Transportation

How urban transportation systems are impacted by and impact climate change.  
Assessment of regulatory and market mechanisms for mitigation and instruments  
for adaptation.



## Health

Impacts of climate change on human health in cities and adaptation measures.



## Land Use

Analysis of how land use zoning and population density interacts with urban  
planning and management to mitigate and adapt to climate change.



## Governance

How city governments may strengthen science-based policy-making,  
effective leadership, efficient financing, jurisdictional coordination, planning,  
and citizen participation.

### SECTION 1

#### DEFINING RISK FRAMEWORK

Vulnerabilities and agency assessed  
Cities, disasters and climate risks  
Science base for city decision-makers

### SECTION 2

#### URBAN SECTORS

Risks  
Adaptation  
Mitigation  
Policy alternatives

#### CASE STUDIES

Range of examples to illustrate  
organizational strategies from range of  
socio-economic and physical city  
conditions

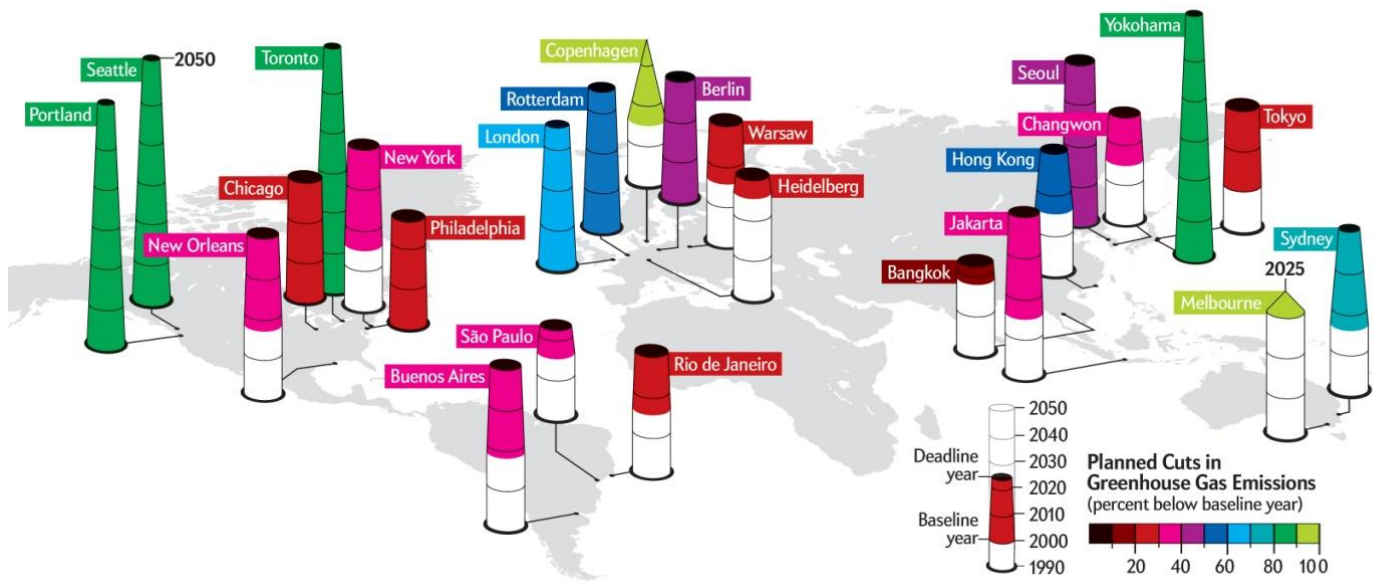
### SECTION 3

#### CROSS-CUTTING ISSUES

Complex interactions among city sectors,  
systems, and land use  
Implication for city governance to combat  
climate change

# KEY MESSAGE

# *Cities are emerging as first responders to climate change*



Planned cuts in greenhouse gas emissions (percent below baseline year) for cities around the globe

# ARC3-2 GOAL

ARC3-2



Second UCCRN Assessment Report  
on Climate Change and Cities

***Enables cities to fulfill their  
climate change  
leadership potential in both  
mitigation and adaptation***

# ARC3-2 PROCESS

## ARC3-2



Second UCCRN Assessment Report  
on Climate Change and Cities

### Scoping

- Needs-assessment input from city actors and experts in developing and developed cities
- Scoping sessions at Resilient Cities 2012 and Rio+20
- Launch of ARC3-2 Process at World Urban Forum 6

### Assessment – 3 years

- Steering Group
- International Hubs, author teams, writing sessions at city association meetings, Terms of Reference
- Case study docking station

### Review

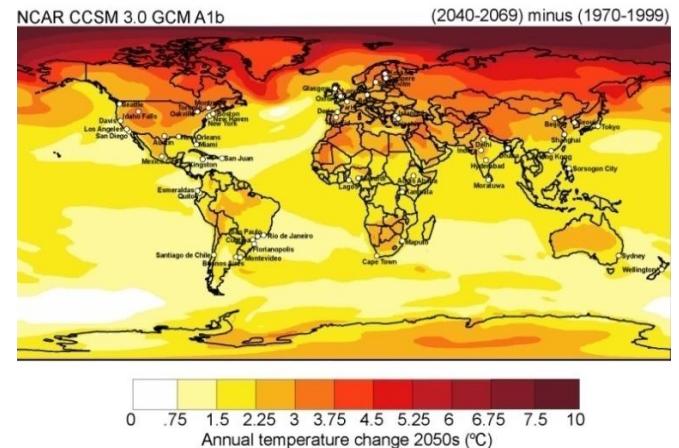
- Experts, Peers, Decision-makers

### Dissemination and Outreach

- Likely publisher: Cambridge University Press
- City Workshop Series on all continents

### Expanded set of Lead and Contributing Authors

- Developing and developed cities
- Both adaptation and mitigation specialists
- Interdisciplinary: Climate scientists, geographers, planners, engineers, policy experts . . .



Source: Center for Climate Systems Research  
Columbia University 2012

# ARC3-2 CONTENT

## ARC3-2



Second UCCRN Assessment Report  
on Climate Change and Cities

**Urban climate science – urban heat island,  
air/water quality, climate change projections**

**Equity and environmental  
justice, including gender and children**

**Role of private sector**

**Attitudes, behavior**

**Finance and technology**

**Migration**

**Urban ecology and biodiversity**

**Urban agriculture and food**

**Urban planning and design**

**Housing and informal settlements**

**Others . . .**



Museum of Modern Art, New York

**[www.uccrn.org](http://www.uccrn.org)**

# CONTACT UCCRN

## ARC3-2



Second UCCRN Assessment Report  
on Climate Change and Cities

To join the Urban Climate Change Research Network  
and learn about *Climate Change and Cities:  
First UCCRN Assessment Report (ARC3)* and  
the process toward *ARC3-2*, go to

[www.uccrn.org](http://www.uccrn.org)

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# DISCUSSION ON ARC3-2 PROCESS AND CONTENT

- How can ARC3-2 be responsive to city decision-maker needs?
- Should urban sector chapters be continued and expanded?
- What new topics should be included in ARC3-2?
- How can case studies be most effectively included?