New York September 2013

UCCRN Overview

Knowledge for Action

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The New School, New York

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RATIONALE

Build Scientific Basis for City Action

New York
2013

Climate Change and Cities

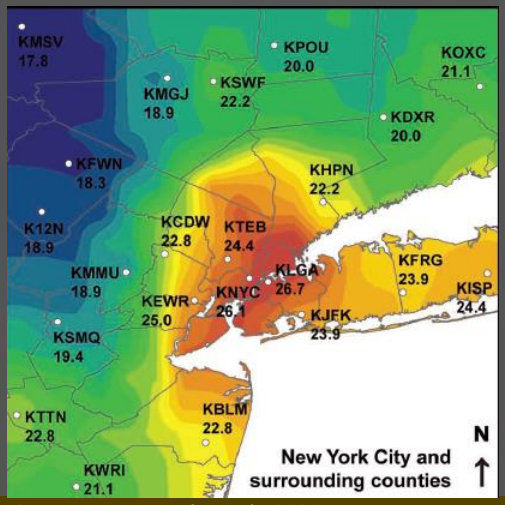
State-of-the-knowledge

Cities generate up to 70% of global GHG emissions and are extremely vulnerable to climate change impacts

Past climate research has overlooked cities despite unique factors

1. Majority of global population is urban
2. Hubs of economic activity
3. Frequently located on coasts or major rivers
4. Urban heat island and air quality problems
5. On front lines dealing with climate impacts

Climate change and water stress in African slums, Kampala



Source: Rosenzweig et al., 2009

Urban Heat Island, New York City

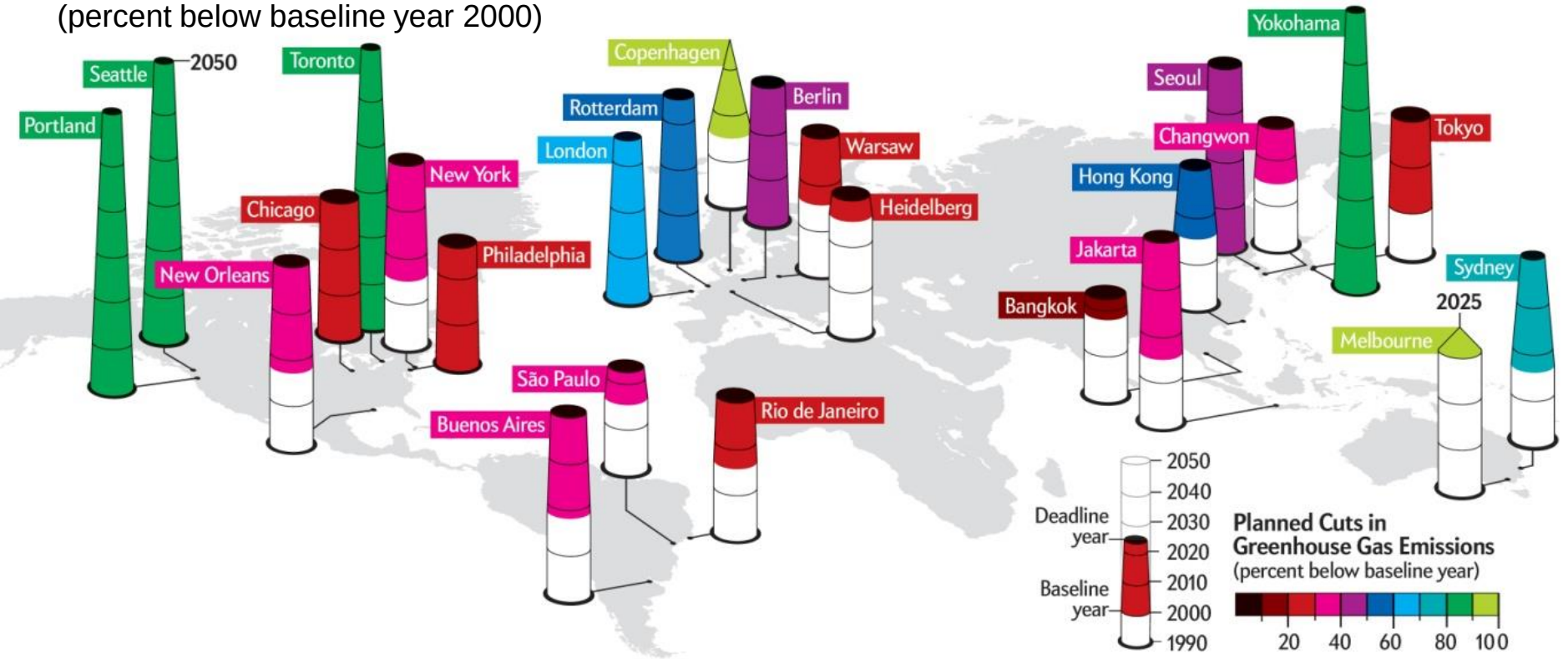
ARC3 Goal

To establish on-going city-centered scientific assessment for state-of-knowledge reports to urban decision-makers and help build capacity for action

Cities combat climate change

2025 GHG emission reduction commitments

(percent below baseline year 2000)



Source: Rosenzweig, *Scientific American*, 2011

ABOUT
ARC3

UCCRN | Overview

New York
2013

Climate Change and Cities

State-of-the-knowledge

Launched at C40 New York in 2008 by Urban Climate Change Research Network

ARC3 content reflects needs assessment feedback from city actors in developing and developed countries

Executive Summary for Mayors and city managers is available online

Book released to Mayors at C40 Sao Paulo and ICLEI Resilient Cities Bonn—Launched in 6 global cities

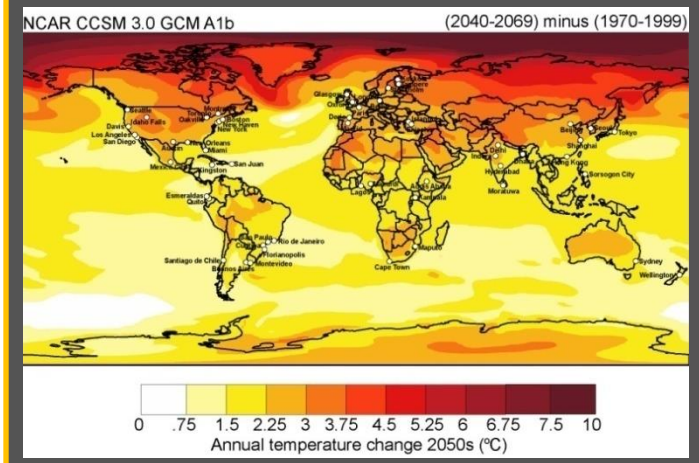
ARC3 Process

Multi-stage review; Report published in 2011
2nd Assessment Launch at WUF 6 2012
Cambridge University Press

100+ lead and contributing authors from over 50 cities

BOTH
adaptation and mitigation specialists

INTERDISCIPLINARY
climate scientists, geographers, planners, engineers, policy experts



Source: Center for Climate Systems Research Columbia University 2011

Cities represented in ARC3

Our Steering Group

North America


Anthony Bigio
Washington DC USA


JoAnn Carmin
Cambridge, USA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New York City, USA


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Boulder, USA


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Oxford, UK


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Newcastle, UK


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London, UK


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Geneva, Switzerland

Africa


Keith Alverson
Nairobi, Kenya


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Lagos, Nigeria


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Durban, South Africa


Rafael Tuts
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South America


Martha Barata
Rio, Brazil


Alice Grimm
Curitiba, Brazil


Claudia E. Natenzon
Buenos Aires, Argentina


Roberto Sanchez-Rodriguez
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Asia


Shobhakar Dhakal
Bangkok, Thailand


Saleemul Huq
Dhaka, Bangladesh


RK Pachauri
Delhi, India


Joyashree Roy
Kolkata, India


Lizhong Yu
Shanghai, China

Australia


David Griggs
Melbourne, Australia


Catherine Neilson
Canberra, Australia

ABOUT
ARC3 Author Locations

Climate Change and Cities

State-of-the-knowledge

Here

UCCRN Cities | 450 Members

Africa

Lagos, Nigeria
Legon, Ghana
Nairobi, Kenya
Dar es Salaam, Ta[illegible]nia
Durban, South Africa

Asia

Ahmedabad, India
Bangalore, India
Bangkok, Thailand
Dhaka, Bangladesh
New Delhi, India
Seoul, South [illegible]rea
Tokyo, Japan
Tsukuba, Japan
Dumangas Iloilo, Philippines
Ulaanbataar, Mongolia
Gorakphur, India
Kanagawa, Japan
Kathmandu, Nepal
Kolkata, India
Manila, Philippines

Australia

Canberra, A[illegible]lia
Highett, Australia
Melbourne, Australia

North America

New York, NY
Norfolk, VA
Seattle, WA
Tarrytown, NY
Toronto, CA
Boulder, CO
Los Angeles, CA, USA
Ottawa, Canada
Washington, DC, USA
Waterloo, Canada

South America

Buenos Aires, Argentina
Curitiba, Brazil
Quito, Ecuador
Rio de Janeiro, Brazil
Santiago, Chile

Europe

London, UK
Nis, Serbia
Paris, France
Durham, NC
Newcastle, UK
Potsdam, Germany
Aalborg, Denmark
Brussels, Belgium
Chilton, Didcot, Oxon, UK
Rotterdam, Netherlands
Geneva, Switzerland
Leipzig, Germany

STRUCTURE

ARC3 1.0

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Climate Change and Cities

State-of-the-knowledge

Risk Framework

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

Climate Science

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 citiesand 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
- Climate hazards assessed using City-specific existing data
- Science base for city decision-makers

SECTION 2

URBAN SECTORS

- Risks
- Adaptation
- Mitigation
- Policy alternatives

CASE STUDIES

- Variety 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

SECTION 1 |

Risk & Science

How do we assess urban climate change risk and what is the role of climate science?

CLIMATE RISK

ARC3

POVERTY

Climate Change and Cities

State-of-the-knowledge

RISK Framework

Source: Mehrotra et al., 2009
Cambridge University Press

Risk is a function of climate hazards, city's physical and social vulnerabilities and institutional agency to combat climate change

Unpacking risk

- Hazards
  - Temperature
  - Precipitation
  - Sea-level rise
- Vulnerability
  - Size and Density
  - Topography
  - % of Poor
  - % of GDP
- Adaptive Capacity
  - Information and Resources
  - Institutions and Governance

CLIMATE HAZARDS

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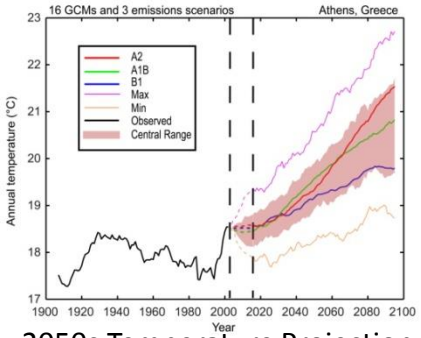
Climate Change and Cities

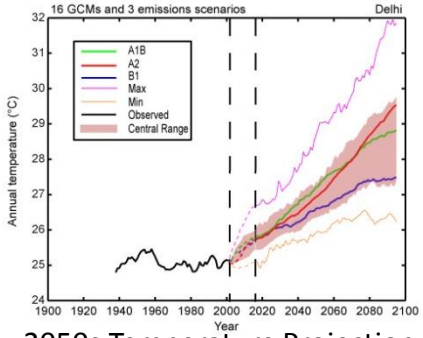
State-of-the-knowledge

Athens



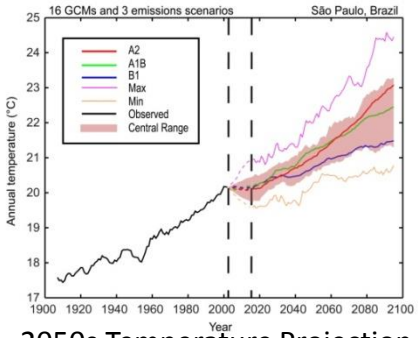
2050s Temperature Projection

Delhi



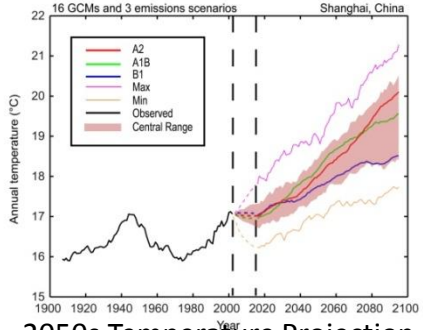
2050s Temperature Projection

Sao Paulo



2050s Temperature Projection

Shanghai



2050s Temperature Projection

12 Cities Analyzed

1. Athens
2. Dakar
3. Delhi
4. Harare
5. Kingston
6. London
7. Melbourne
8. New York
9. Sao Paulo
10. Shanghai
11. Tokyo
12. Toronto

2050s projected temperature increase between 1˚ C to 4˚ C

HAZARDS takeaway

1. More frequent/longer/hotter heatwaves
2. More floods and droughts
3. Sea-level rise with enhanced coastal flooding

Source: Center for Climate Systems Research Columbia University 2009

SECTION 2 |

Urban Sectors

Given the risk assessments, what are the implications for urban infrastructure?

HEALTH

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Climate Change and Cities

State-of-the-knowledge

Risks

1. Large city and high density amplify health risks
2. Increase in poor and elderly populations compounds threats of heat and vector-related illness
3. Cities with limited existing services at greater risk of drought and vector-related illnesses

Adaptation and Mitigation strategies

1. ***Passive approaches***—tree planting, green roofs, permeable pavements—to reduce urban heat island
2. Improving and increasing water and energy services
3. Regulate settlement growth in flood plains
4. Expand health surveillance and early warning systems—technology and people: buddy systems

Source: Shagun Mehrotra, 2003

High Existing Health Risks, Kibera, Nairobi

Source:

Heatwave exacerbates existing health risks of poor & elderly in NYC, July 4–6, 1999

HEALTH takeaway

Climate change likely to exacerbate existing health risks in cities and create new ones

WATER
ARC3

Climate Change and Cities
State-of-the-knowledge

Risks

1. Variance in precipitation significantly affects quantity and quality of water supply
2. Impervious city surfaces and increased precipitation intensity overwhelm current city drainage systems
3. Over 1/2 the people in large developing country cities rely on informal water supply—vendors

Adaptation and Mitigation strategies

1. Reduce water theft and leaks
2. Adjust water-intake locations
3. Rainwater harvesting and water reuse
4. Demand management—public education, industrial process changes to reduce water intensity

WATER take away

Water supply services highly vulnerable to drought, extreme precipitation, and sea level rise

Source: Ademolo Omojola

Water Scarcity and Vendors, Lagos

Source: WSP, The World Bank

Water supply systems are at risk

TRANSPORT

ARC3

Risks—contingent on local transport systems

1. Mass transit vs. individual vehicles
2. Underground vs. elevated roads and rail
3. Moving people vs. goods
4. Impacts on power and telecom systems create transport system risks—inter-modal issues

Adaptation and Mitigation strategies

1. Technical vs. ecosystem-based approaches
2. Levees, dams, pumps to limit flood damage
3. Improve drainage to protect transport assets
4. Elevate equipment to eliminate flood risk
5. Temporarily move rolling stock in advance of storms
6. Diversify transport modal choices

Compressed Natural Gas, Cabs, Delhi

Civil society organizations and courts have been instrumental in legislating conversion of public transport to be fuelled by CNG

TRANSPORT takeaway

Incorporate climate considerations into transit plans, construction, and management systems while retrofitting existing assets

Risks—contingent on energy systems

1. Power plant flooding
2. Increased variance in water quantity and timing impact hydro-power
3. Increase in heat waves imply more frequent blackouts, damaging local economy
4. Demand may increase *or* decrease

Adaptation and Mitigation strategies

1. Demand management programs to cut peak load
2. "Harden" power plants and networks to increase resilience to flooding/storm/temperature risks
3. Diversify fuel-mix for city power to increase share of renewables

Coal Based Energy Supply, Baoshan

ENERGY takeaway

Mitigation prioritized, but adaptation focus equally important

SECTION 3 |

City-wide Issues

Given the risk assessments, sectoral implications, what does this mean for the city as a whole?

GOVERNANCE

ARC3, Local Climate Action

Challenges

1. **Many competing issues** on local government's agenda
2. **Temporal tradeoffs** between current priorities and long-term risks
3. **Uncertainty** in local impact affects prioritization of investments & action
4. **Local authorities constrained** by policy and fiscal space
5. **Jurisdictional conflicts**, multiple stakeholders

WAY FORWARD

1.Science-based policy-making
2.Effective leadership
3.Efficient financing
4.Jurisdictional coordination
5.Land-use planning
6.Citizen participation

GOVERNANCE takeaway

Local authorities recognize the challenge and many **are taking action**

TAKEAWAYS

ARC3—CITIES ACT

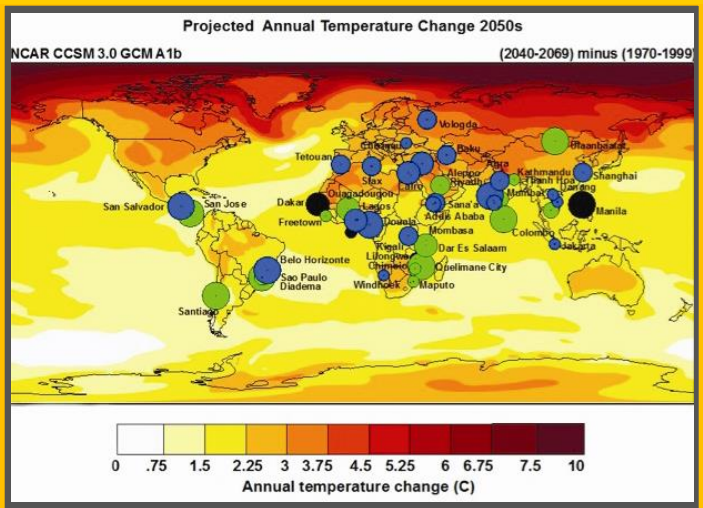
Climate Change and Cities

State-of-the-knowledge

1. **Cities are at high risk**, but have several mechanisms to adapt and mitigate

2. **Cities serve as laboratories** for climate change action, despite constraints

3. **Ample climate risk & response information**, yet in limited use



Many cities develop long-term action plans each year—
but most neglect climate risks

Risk Reduction

By mainstreaming climate science, adaptation, and mitigation actions into ongoing and planned investments

What NEXT?

Post 2015
New York

UN Secretary General launches
Sustainable Development Solutions Network

New York
2013

Climate Change and Cities

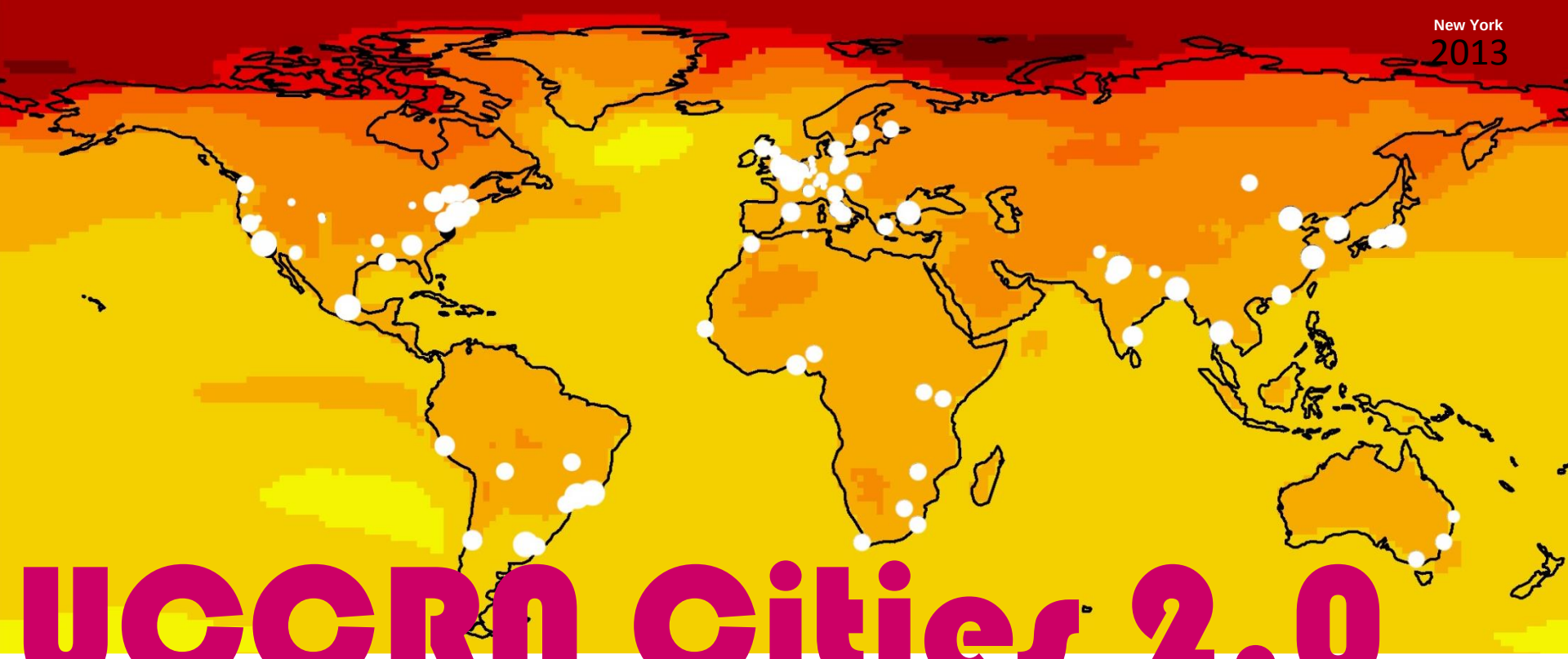
Second Assessment Report of the Urban Climate Change Research Network

CAMBRIDGE

SECTION 4 | Discussion

Cities Act

2.0



UCCRN Cities 2.0

Africa

Abuja
Cape Town
Dakar
Durban
Harare
Johannesburg
Kampala
Nairobi
Rabat
Setif
Sfax
Lagos

Asia

Bangkok
Beijing
Chennai
Delhi
Dhaka
Eskisehir
Hong Kong
Jaipur
Kathmandu
Kyoto
Nagoya
Ningbo
Sargodha
Seoul
Shanghai
Tokyo
Ulaanbaatar
Indore
Mumbai

Australia

Australia & Oceania
Gold Coast
Melbourne
Parkville
Sydney
Townsville
Wellington
Wembley

Europe

Aalborg
Athens
Barcelona
Berlin
Bonn
Bristol
Brussels
Copenhagen
Enschede
Exeter
Freiburg
Geneva
Glasgow
Groningen
Helsinki
Istanbul
Kokkola
Leipzig
London
Luxembourg
Naples
Newcastle upon Tyne
Oxford
Paris
Peterborough
Planken
Potsdam
Rome
Stockholm
Stuttgart
Tallinn
Trieste
Venice
Vienna

North America

Amherst
Atlanta
Aurora
Baton Rouge
Boston
Boulder
Cambridge
College Park
College Station
East Lansing
Englewood
Eugene
Guelph
Hauppauge
Idaho Falls
Kingston
Los Altos
Los Angeles
Mexico City
Montreal
Mountain View
New Haven
New Orleans
New York
Norfolk
North Little Rock
Nyack
Ottawa
Reno
Sacramento
Saint Catherines
San Diego
Seattle
Toronto
Tucson
Washington DC

South America

Brasilia
Buenos Aires
Concón
Curitiba
Lima
Montevideo
Rio de Janeiro
Santa Cruz
Santiago
Sao Paulo

Regional Hubs

Africa

Abuja
Cape Town
Dakar
Durban
Harare
Johannesburg
Kampala
Nairobi
Rabat
Setif
Sfax
Lagos

Asia

Bangkok
Beijing
Chennai
Delhi
Dhaka
Eskisehir
Hong Kong
Jaipur
Kathmandu
Kyoto
Nagoya
Ningbo
Sargodha
Seoul
Shanghai
Tokyo
Ulaanbaatar
Indore
Mumbai

Australia

Australia & Oceania
Gold Coast
Melbourne
Parkville
Sydney
Townsville
Wellington
Wembley

Europe

Aalborg
Athens
Barcelona
Berlin
Bonn
Bristol
Brussels
Copenhagen
Enschede
Exeter
Freiburg
Geneva
Glasgow
Groningen
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Istanbul
Kokkola
Leipzig
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Naples
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Oxford
Paris
Peterborough
Planken
Potsdam
Rome
Stockholm
Stuttgart
Tallinn
Trieste
Venice
Vienna

North America

Amherst
Atlanta
Aurora
Baton Rouge
Boston
Boulder
Cambridge
College Park
College Station
East Lansing
Englewood
Eugene
Guelph
Hauppauge
Idaho Falls
Kingston
Los Altos
Los Angeles
Mexico City
Montreal
Mountain View
New Haven
New Orleans
New York
Norfolk
North Little Rock
Nyack
Ottawa
Reno
Sacramento
Saint Catherines
San Diego
Seattle
Toronto
Tucson
Washington DC

South America

Brasilia
Buenos Aires
Concón
Curitiba
Lima
Montevideo
Rio de Janeiro
Santa Cruz
Santiago
Sao Paulo

PROCESS

ARC3 2.0

UCCRN | Sustainable Urban Futures

New York 2013

Climate Change and Cities

State-of-the-knowledge

2.0

2nd City Needs Assessment

Expert inputs from developing and developed cities at **Resilient Cities 2012, Rio+20,** ongoing

Launch of 2nd ARC3 Process at World Urban Forum 6, Napoli

2nd Assessment {2012 – 2015}

Renew **Steering Group** (Terms of Reference)
First Workshop at Columbia University in early 2013
6 continental **global hubs**, **author teams**, **writing sessions** urban meetings, Expand **case study** cities

Peer Review, Three-Tier Process

Scholars, city decision-makers, global development agencies

2nd ARC3 Outreach

Dissemination and Outreach—Six Continental Workshops on Knowledge for Action
Cambridge University Press (Likely Publisher)

Authors invited to join

100+ authors from over 50 cities

BOTH
adaptation and mitigation specialists

INTERDISCIPLINARY
All engaged in urban research and policy making are welcome!

PROCESS

ARC3 2.0

UCCRN | Sustainable Urban Futures

New York 2013

Climate Change and Cities 2.0

State-of-the-knowledge

Global Outreach

100+ authors from over 50 cities

BOTH
adaptation and mitigation specialists

INTERDISCIPLINARY
All engaged in urban research and policy making are welcome!

Stakeholder engagement—Catalytic Role of UCCRN

CONSULTATION
Cities Act, Need New Knowledge

UCCRN | Sustainable Urban Futures

New York 2013

Climate Change and Cities 2.0

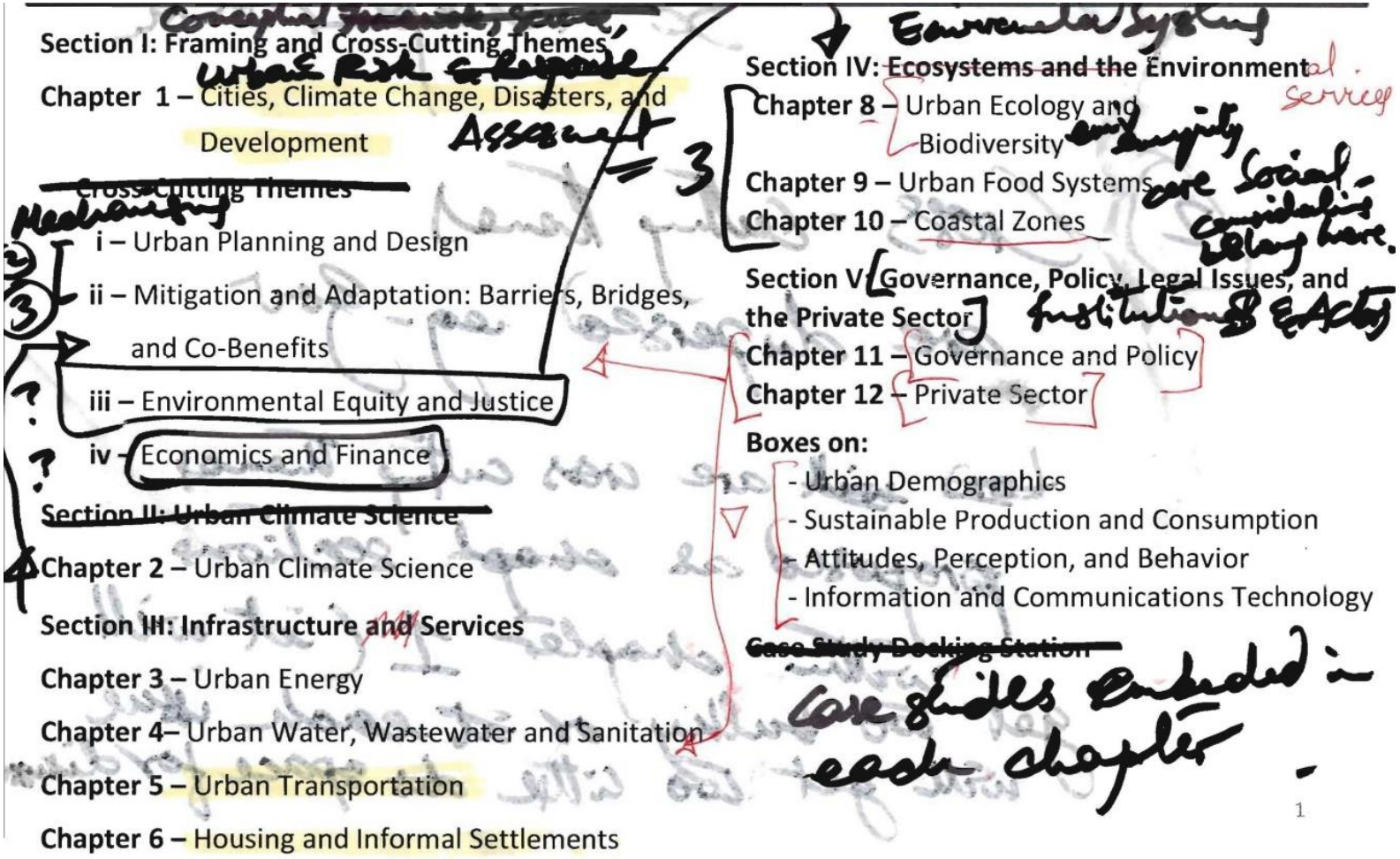
State-of-the-knowledge

1. How can ARC3 2.0 **respond better to city needs**?
2. Should **urban sector chapters—transport, energy, water, public health—**be continued and expanded?
3. What **new topics** should be included in ARC3 2.0?
4. How can **case studies** be better integrated?
5. Any other issues?

Potential new topics

Slums
Infrastructure
Economic development
Environmental justice
Private sector
Finance
Behavior
Migration
Ecology
Agriculture & food
Urban design
Your suggestions

Draft Outline ARC3 2.0



Section I: Framing and Cross-Cutting Themes

Chapter 1 – Cities, Climate Change, Disasters, and Development

Cross-Cutting Themes

i – Urban Planning and Design

ii – Mitigation and Adaptation: Barriers, Bridges, and Co-Benefits

iii – Environmental Equity and Justice

iv – Economics and Finance

Section II: Urban Climate Science

Chapter 2 – Urban Climate Science

Section III: Infrastructure and Services

Chapter 3 – Urban Energy

Chapter 4– Urban Water, Wastewater and Sanitation

Chapter 5 – Urban Transportation

Chapter 6 – Housing and Informal Settlements

Section IV: Ecosystems and the Environment

Chapter 8 – Urban Ecology and Biodiversity

Chapter 9 – Urban Food Systems

Chapter 10 – Coastal Zones

Section V: Governance, Policy, Legal Issues, and the Private Sector

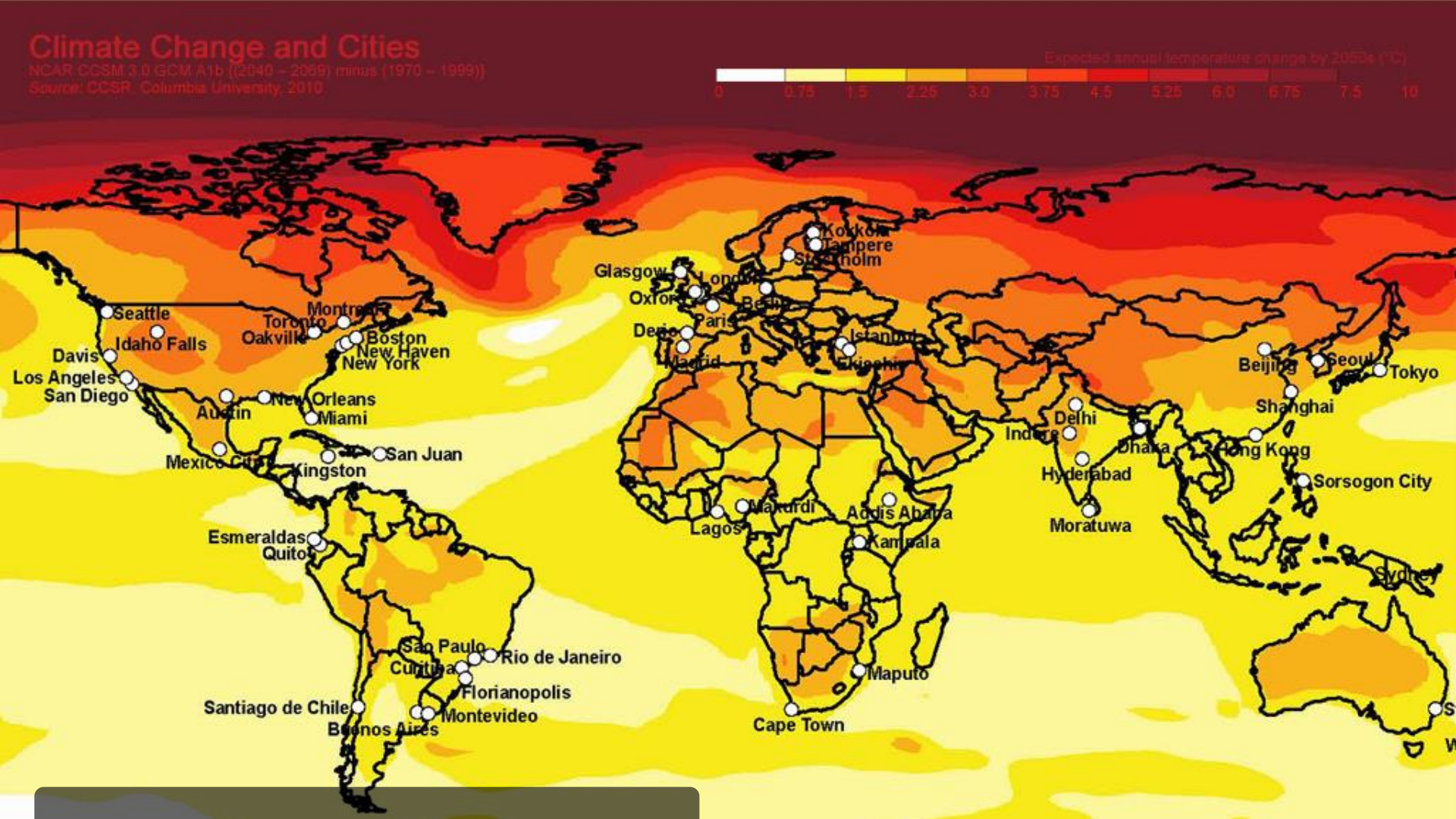
Chapter 11 – Governance and Policy

Chapter 12 – Private Sector

Boxes on:

- Urban Demographics
- Sustainable Production and Consumption
- Attitudes, Perception, and Behavior
- Information and Communications Technology

Case Study: Docking Station



Thank You

UCCRN | Knowledge for Action

Climate Change and Cities

SOLUTIONS

CITIES ACTS

UCCRN | Overview

New York
2013

Climate Change and Cities 2.0

State-of-the-knowledge

Emerging Issues

1. **Establish a panel** in collaboration with, and for, the city
2. **City-specific climate change risk assessment process** to be integrated into city development plans & strategies
3. **Leverage ongoing and planned investments** to reduce risk—enhance competitiveness and inclusion

Objective

to continue knowledge assessment for enhanced city action
to build capacity for city climate action through continuous sharing of cutting-edge research

Urban Climate Change Research Network
www.uccrn.org