



Adapting Cities to Climate Change: Opportunities and Constraints

Dirk Heinrichs, Helmholtz-Centre for Environmental Research - UFZ



Adapting Cities to Climate Change: Opportunities and Constraints

Rimjhim Aggarwal, Arizona State University, Rimjhim.Aggarwal@asu.edu

Jonathan Barton, Pontificia Universidad Católica de Chile, jbarton@puc.cl

Erach Bharucha, Bharati Vidyapeeth Institute of Environmental Education and Research, bvier@vsnl.com

Carsten Butsch, University of Cologne, butschc@uni-koeln.de

Michail Fragkias, Arizona State University, Michail.Fragkias@asu.edu

Dirk Heinrichs, Helmholtz Centre for Environmental Research -UFZ, dirk.heinrichs@ufz.de

Peter Johnston, Cape Town University, johnston@csag.uct.ac.za

Frauke Kraas, University of Cologne, f.kraas@uni-koeln.de

Kerstin Krellenberg, Helmholtz Centre for Environmental Research-UFZ, kerstin.krellenberg@ufz.de

Andrea Lampis, Universidad de los Andes Bogotá, alampis@uniandes.edu.co

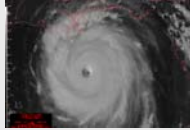
Ooi Giok Ling, Nanyang Technological University, giokling.ooi@nie.edu.sg



Research Questions



What opportunities for and constraints to local climate adaptation action exist?



To what are cities adapting?

- Exposure to climate change and climate stimuli
- anticipated impacts and 'knock-on' effects
- reinforcing local conditions



Who is adapting and what motivates action?

- Actors: lead agency, coordination mechanisms/participation
- Action: motivating factors, policy fields, type of action



How does adaptation occur?

- Tools: information flows, awareness creation and communication
- links to existing urban policy
- knowledge basis, implementation and compliance, financing

Methodology: the case cities / city regions

World Map of Köppen–Geiger Climate Classification

updated with CRU TS 2.1 temperature and VASCLimO v1.1 precipitation data 1951 to 2000



Main climates

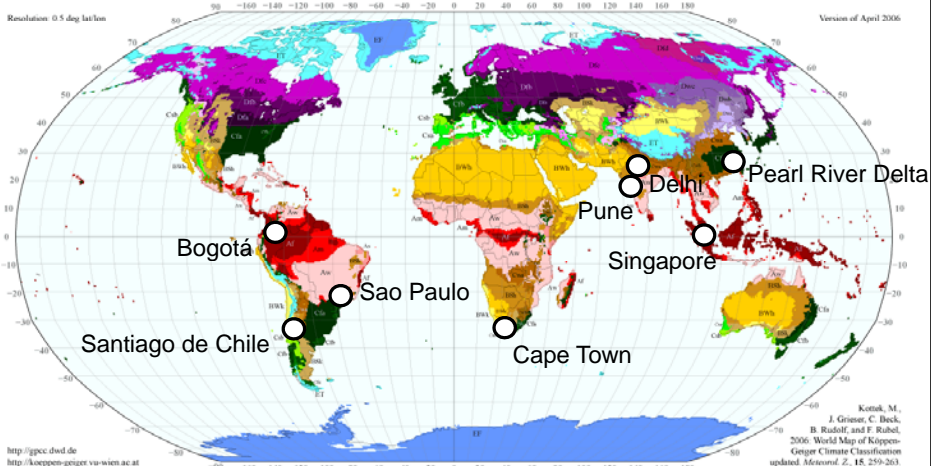
- A: equatorial
- B: arid
- C: warm temperate
- D: snow
- E: polar

Precipitation

- W: desert
- S: steppe
- f: fully humid
- sd: summer dry
- w: winter dry
- m: monsoonal

Temperature

- h: hot arid
- lc: cold arid
- a: hot summer
- b: warm summer
- c: cool summer
- d: extremely continental
- F: polar frost
- T: polar tundra




Results



To what are cities adapting?

Affected sector/service/use	Bogotá	Cape Town	Delhi	Pearl River Delta	Pune	Santiago	Sao Paulo	Singapore
Water	x	x	x	x	x	x	x	x
Ecosystems; Biodiversity	x	x			x			
Food	x	x		x				
Health	x	x	x	x	x	x	x	x
Infrastructure		x	x	x			x	x
Energy			x	x	x	x	x	x
Human settlement (floods, sea level rise)		x	x	x	x	x	x	x

(Typology based on World Bank 2006)

 Local Climate Action Plan adopted/implemented

 Local Plan not yet in place

Page 5

Results



To what are cities adapting?

- Cities face particular **stress bundles**:
(a) anticipated additional climate change related effects, b) already high stress on sensitive resources, (c), and local reinforcing factors



Who is adapting and what motivates action?

- 'Early movers' use local **climate action purposefully as an opportunity to promote already existing priorities**
- Adaptation action is motivated/constrained by a wide range of factors



How does adaptation occur?

- Local climate action benefits from a combination of 'external' and 'local' **knowledge**

Page 6

Conclusion: Implications for policy and research

1. Focus on **stress bundles**
 - define adaptation outside the 'narrow' definition context of 'adaptation to anthropogenic climate change'
 - Understand human-environment interactions
2. Capture **innovative potential** of adaptation
 - Emphasize and support existing strategies and priorities
 - Include 'new' concerns and measures
3. Understand the **capacity portfolio** of opportunities and constraints
 - As instrument for developing assumptions regarding when, how and to what challenges cities adapt
 - For capacity building

Page 7



Image: A. Künzelmann, UFZ



Federal Ministry
for Economic Cooperation
and Development



Urbanization and Global
Environmental Change
AN IHDP CORE PROJECT

HELMHOLTZ
GEMEINSCHAFT

Results: capacities for adaptation

Enabling /disabling context

Resources (ability)

Motivation (willingness)

- general political preference of citizens
- social acceptance of technologies
- path-dependent system of rules, institutional structures and habitual practices

- Administrative, political, financial authority
- social / human capital, networks, 'Civic capacity'
- **knowledge resources, information, decision support, learning/reflexive evaluative decision making, available technologies**

- **experience with extreme events / disasters,**
- Political reward: satisfaction of preference of voters
- Leadership: innovative capacity
- **(Un-)certainty about threats of climate change**
- **risk perception**
- perceived adaptive capacity
- (Potential) incentives: finance, information, ideas