Potsdam Institute for Climate Impact Research

Climate change & development group

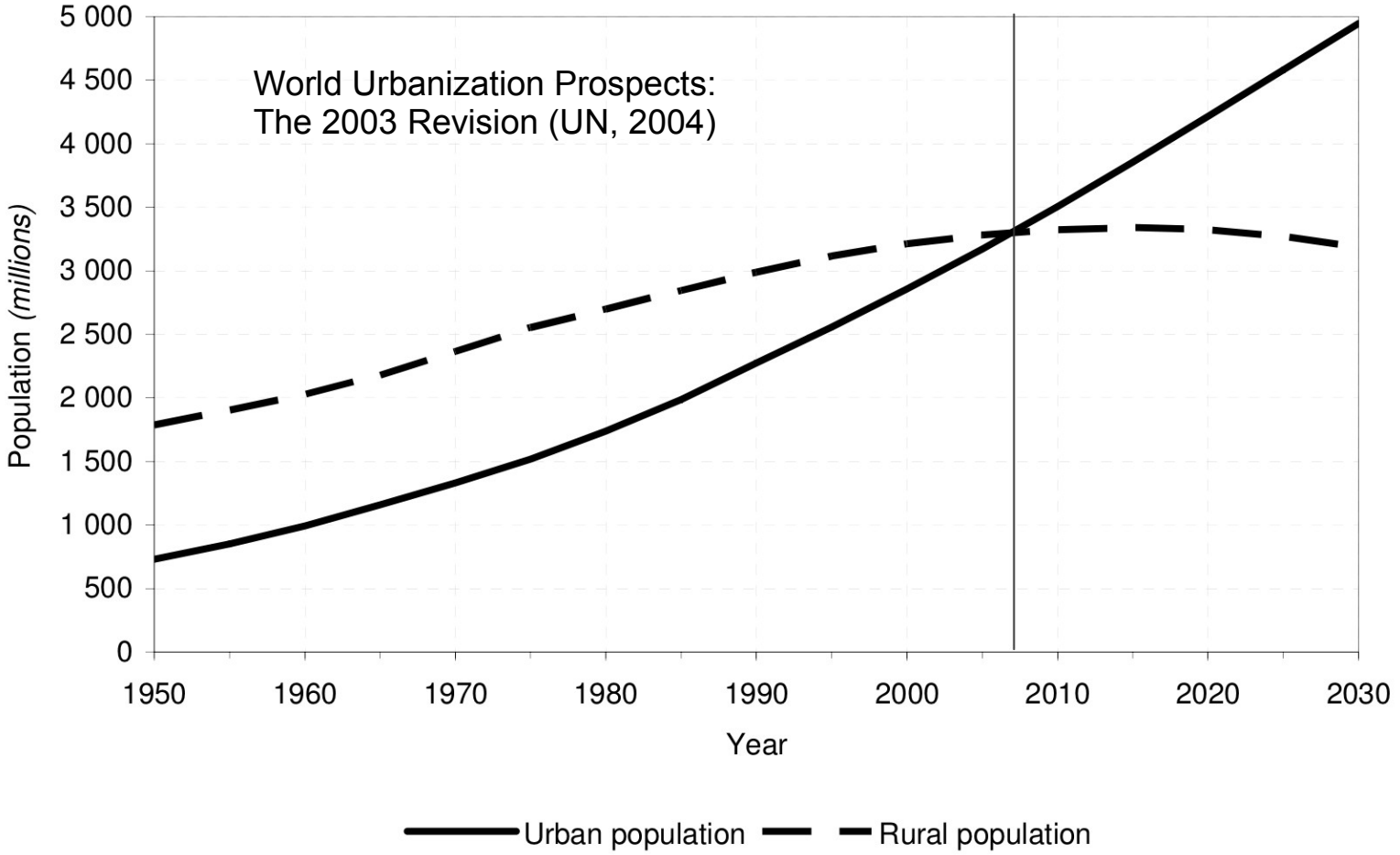
About the role of cities in the climate change policy-making

Diego Rybski

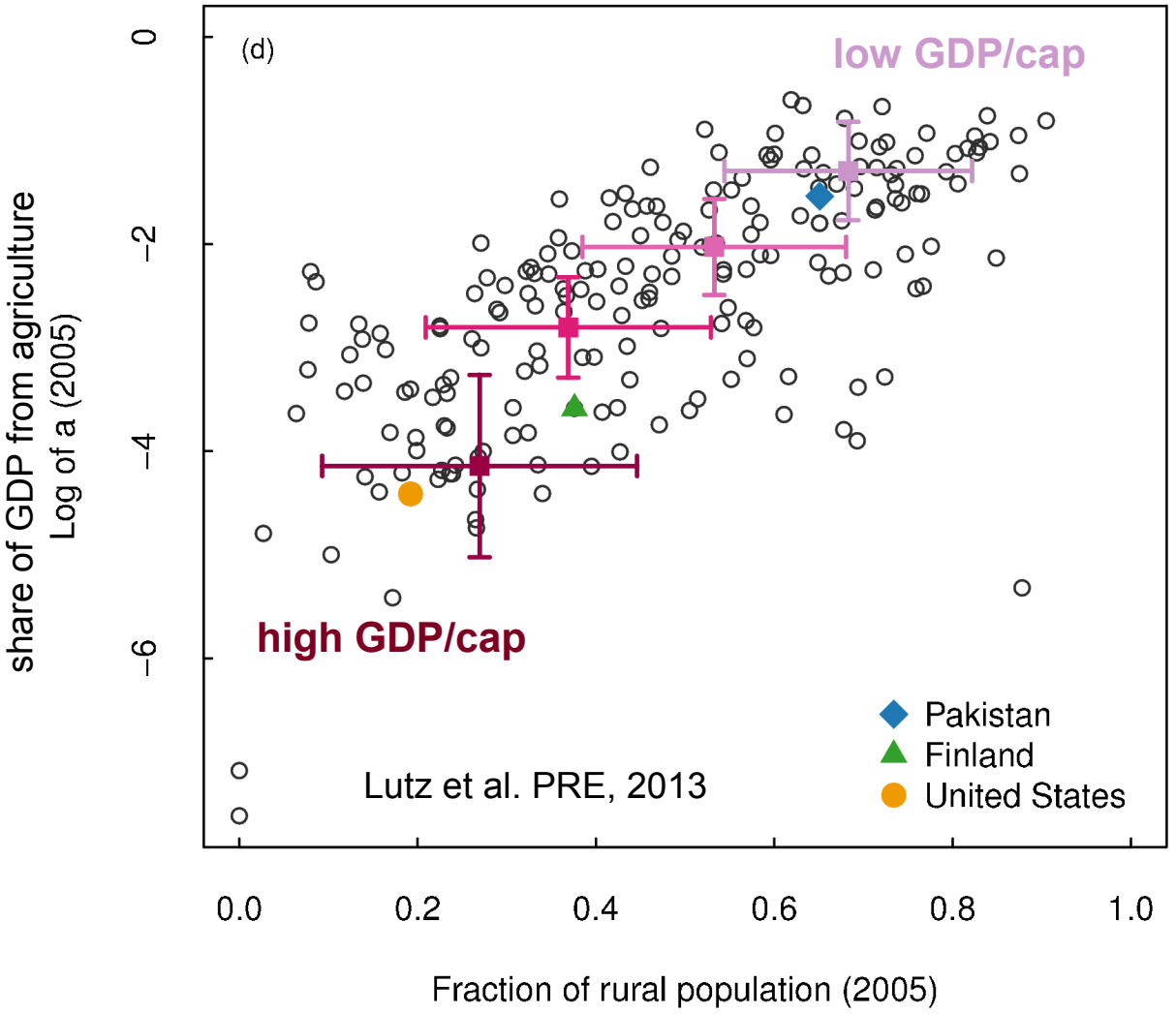
Brussels, 10.2.2014
10:40–11:10

Prolog

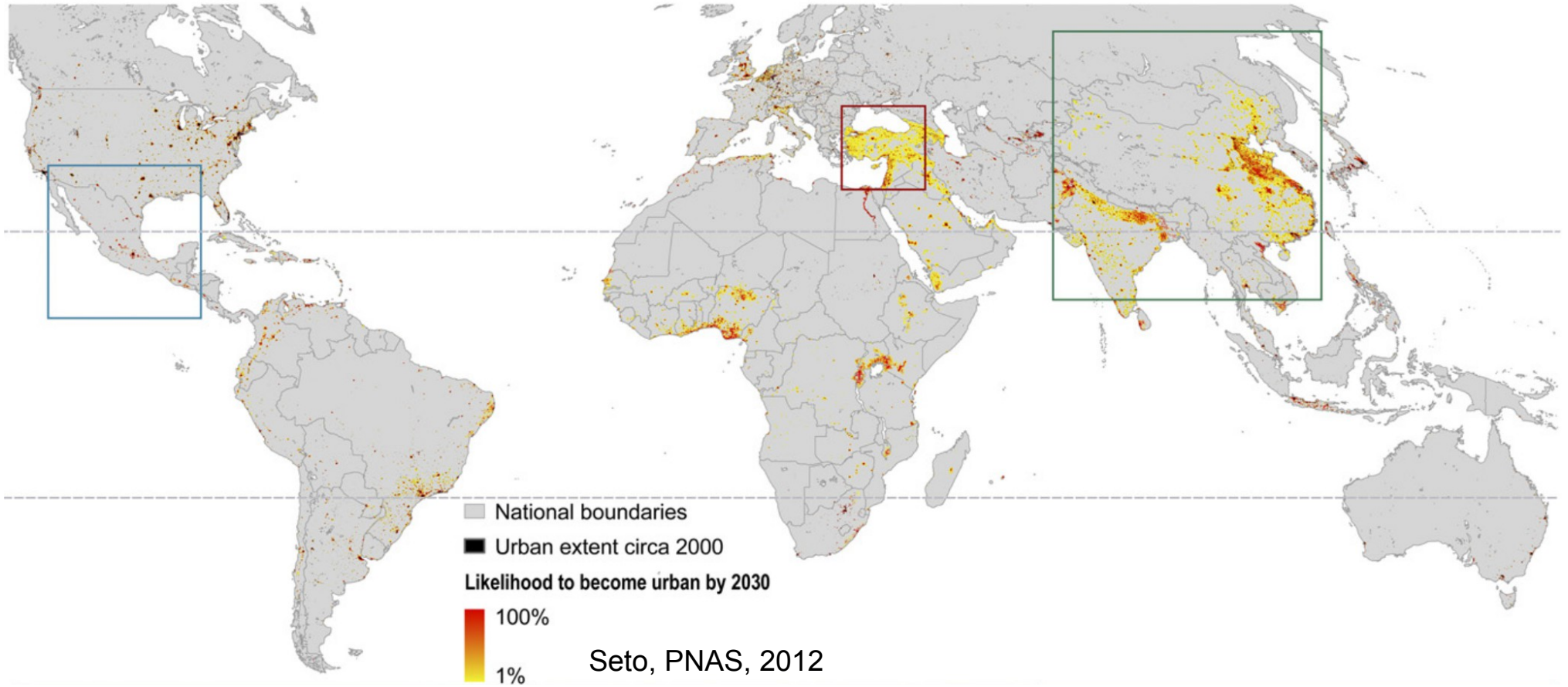
Figure I.1. Urban and rural populations of the world: 1950-2030



Prolog


(d)
low GDP/cap
high GDP/cap
Lutz et al. PRE, 2013
Pakistan
Finland
United States
share of GDP from agriculture
Log of a (2005)
0
−2
−4
−6
0.0
0.2
0.4
0.6
0.8
1.0
Fraction of rural population (2005)

Prolog: Global Urbanization by 2030



Seto, PNAS, 2012

Climate change impacts in general

Very briefly:

> release of CO2 and other greenhouse gases

> global warming

> consequences

Climate change impacts in general

Very briefly:

> release of CO2 and other greenhouse gases

> global warming

> consequences

- alteration of climate zones
- melting of sea&land-ice
  - sea-level rise
- acceleration of hydrological cycle
- feedback-effects
- other less predictable effects (e.g. circulation)

Sea level rise

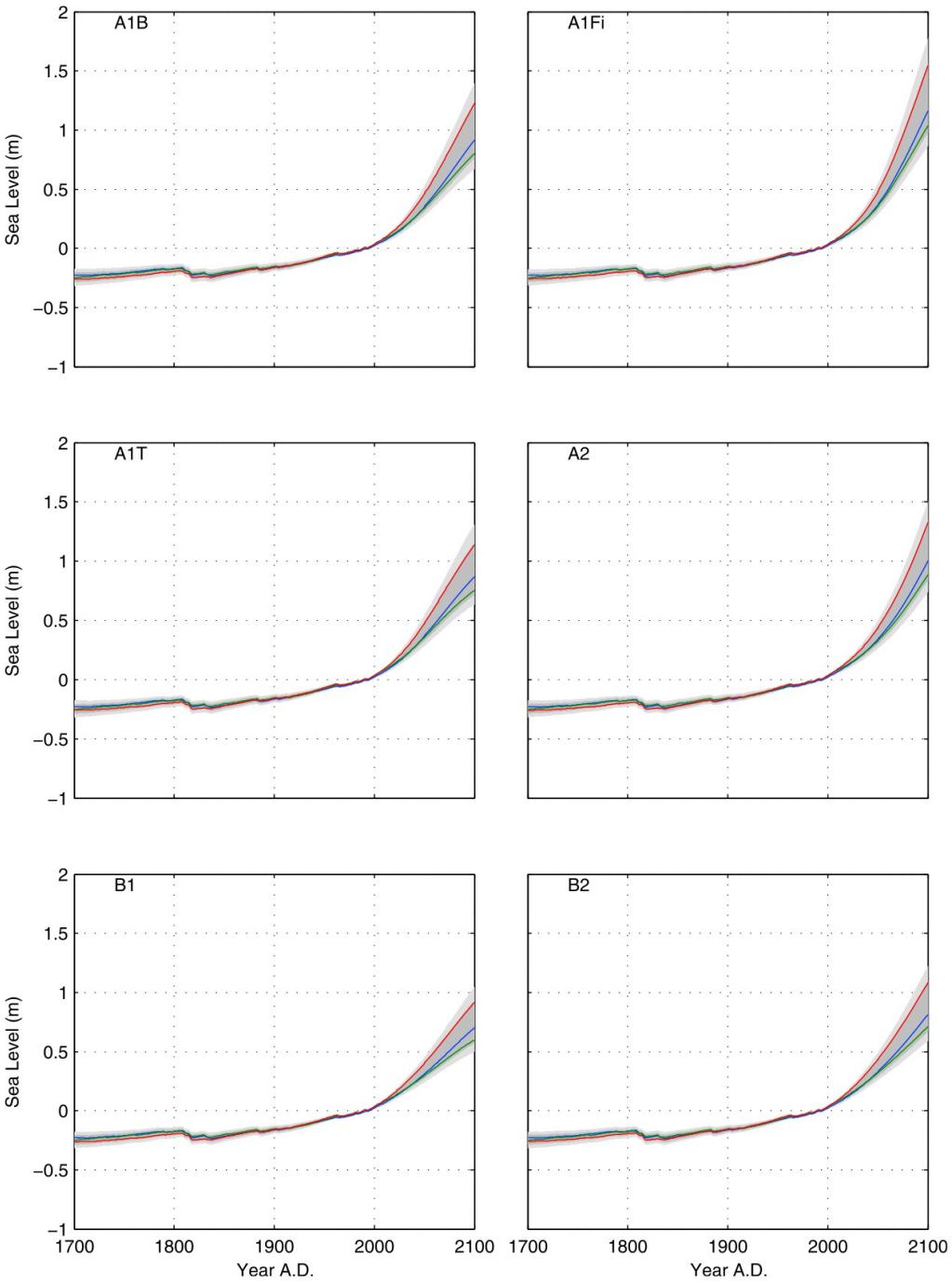
from land-ice

rate approx. proportional to warming

least uncertain consequence

local effects

approx. 1m relative to 1980-2000



SRES scenarios

colors: different authors

gray: Uncertainty

relative to 1990

Jevrejeva, GRL, 2010

Figure 2. Projections of sea level rise during the 21st century using six IPCC radiative forcing scenarios, numbers are given relative to the period 1980–2000. Colors represent model parameters calculated using past forcings, colors and shaded bands are as Figure 1.

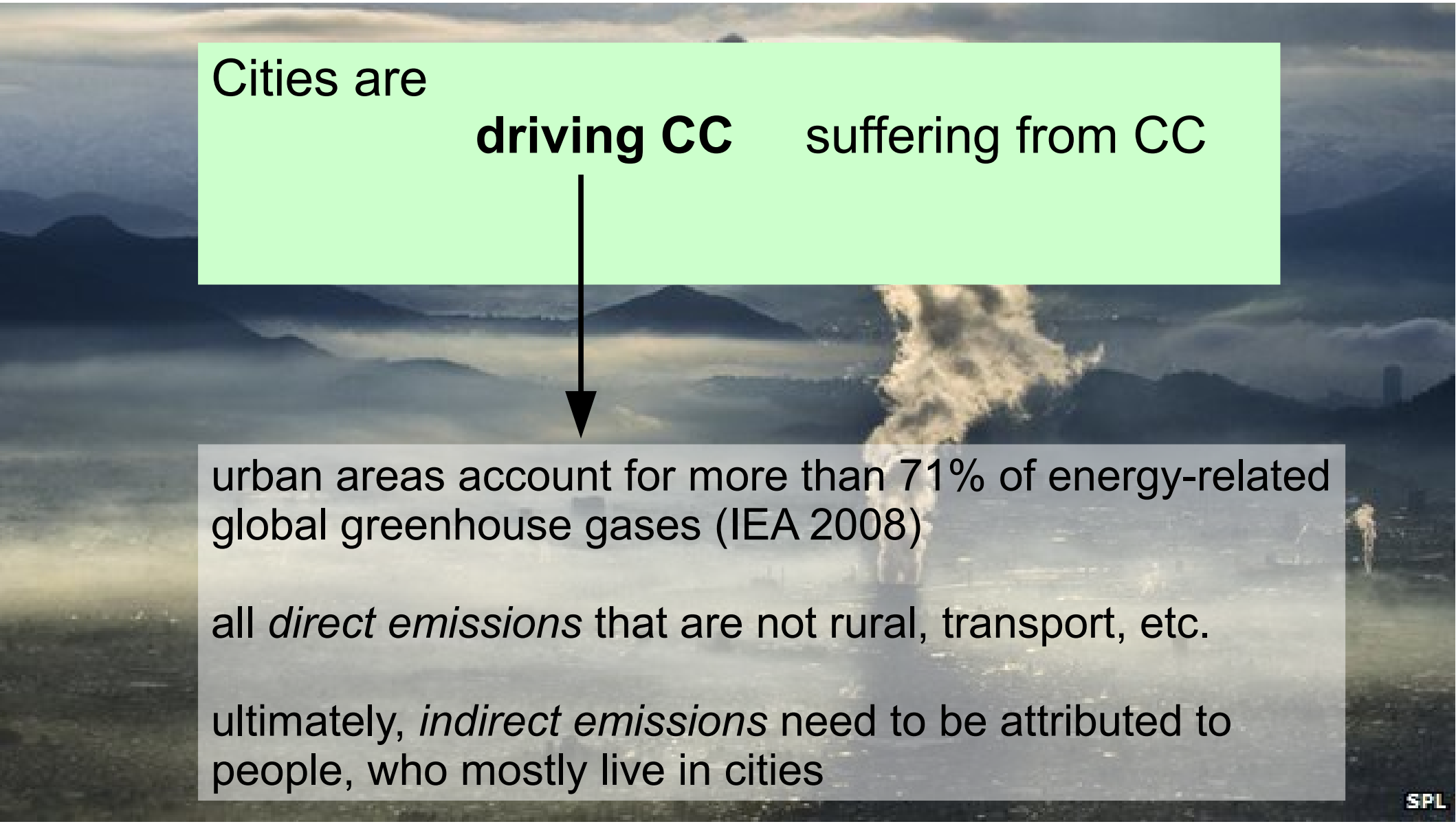
Cities in the climate change (CC) complex

Cities are

driving CC

suffering from CC

Cities in the climate change (CC) complex



Cities are

driving CC suffering from CC

urban areas account for more than 71% of energy-related global greenhouse gases (IEA 2008)

all *direct emissions* that are not rural, transport, etc.

ultimately, *indirect emissions* need to be attributed to people, who mostly live in cities

http://www.bbc.co.uk/news/science-environment-21345116

Cities in the climate change (CC) complex

Cities are

driving CC **suffering from CC**

climate change impacts: cities exhibit high density of people and assets

all impacts except agriculture, industry, etc.

cities are *the place* where people are affected

Foto: wikimedia

Global report on human settlements 2011: 1/3 (Cities and climate change, UN Habitat)

Climate change risks facing urban areas

- *Sea-level rise*
- *Tropical cyclones*
- *Heavy precipitation events*
  - flooding
  - landslides
- *Extreme heat events*
- *Drought*

Impacts upon physical infrastructure

- *Residential and commercial structures*
- *Transportation systems*
- *Energy systems*
- *Water and sanitation systems*

Global report on human settlements 2011: 2/3 (Cities and climate change, UN Habitat)

Economic impacts

Sectoral economic impacts

Industry and commerce

Tourism and recreation

Insurance

Ecosystem services

Livelihood impacts

Public health impacts

Global report on human settlements 2011: 3/3 (Cities and climate change, UN Habitat)

Social impacts

Poverty

Gender

Age

Ethnic and other minorities

(including indigenous groups)

Displacement and forced migration

etc.

Climate change threats & natural disasters

Table 4.1

Projected impacts upon urban areas of changes in extreme weather and climate events

Global report on human settlements 2011 (Cities and climate change, UN Habitat)

Climate phenomena	Likelihood	Major projected impacts
Fewer cold days and nights	Virtually certain	Reduced energy demand for heating
Warmer and more frequent hot days and nights over most land areas	Virtually certain	Increased demand for cooling
Warmer temperatures	Virtually certain	Reduced disruption to transport due to snow, and ice effects on winter tourism Changes in permafrost, damage to buildings and infrastructures
Warm spells/heat waves: frequency increases over most land areas	Very likely	Reduction in quality of life for people in warm areas without air conditioning; impacts upon elderly, very young and poor, including significant loss of human life Increases in energy usage for air conditioning
Heavy precipitation events: frequency increases over most areas	Very likely	Disruption of settlements, commerce, transport and societies due to flooding Significant loss of human life, injuries; loss of, and damage to, property and infrastructure Potential for use of rainwater in hydropower generation increased in many areas
Areas affected by drought increase	Likely	Water shortages for households, industries and services Reduced hydropower generation potentials Potential for population migration
Intense tropical cyclone activity increases	Likely	Disruption of settlements by flood and high winds Disruption of public water supply Withdrawal of risk coverage in vulnerable areas by private insurers (at least in developed countries) Significant loss of human life, injuries; loss of, and damage to, property Potential for population migration
Increased incidence of extreme high sea level (excludes tsunamis)	Likely	Costs of coastal protection and costs of land-use relocation increase Decreased freshwater availability due to saltwater intrusion Significant loss of human life, injuries; loss of, and damage to, property and infrastructure Potential for movement of population

Climate change threats & natural disasters

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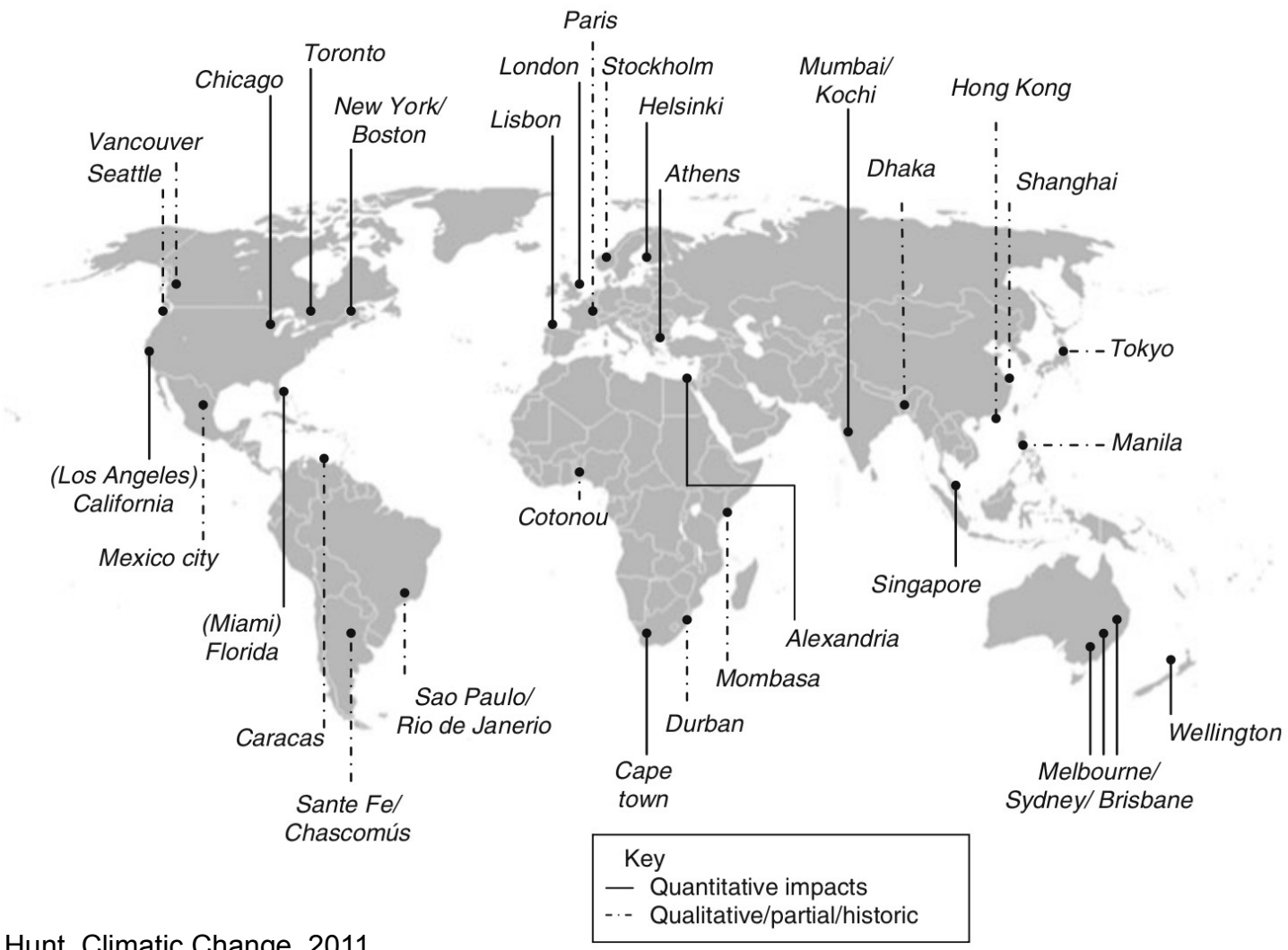
extreme events frequency & intensity expected to increase due to CC occur in combination attribution

Climate change city studies



Hunt, Climatic Change, 2011

Fig. 1 Geographical location of selection of major city studies

small number of cities

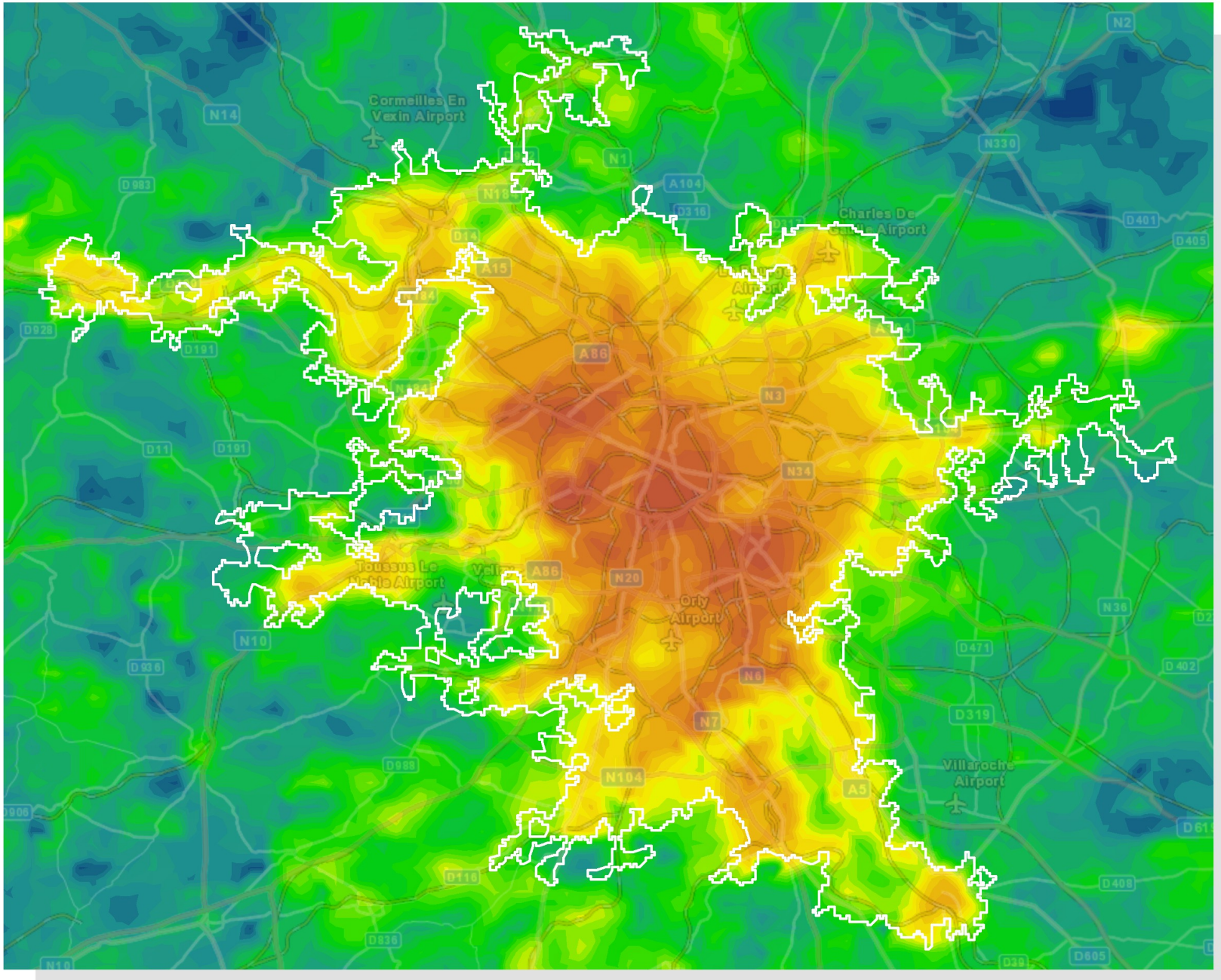
mostly in OECD countries

mostly:
sea-level rise,
health,
water resources

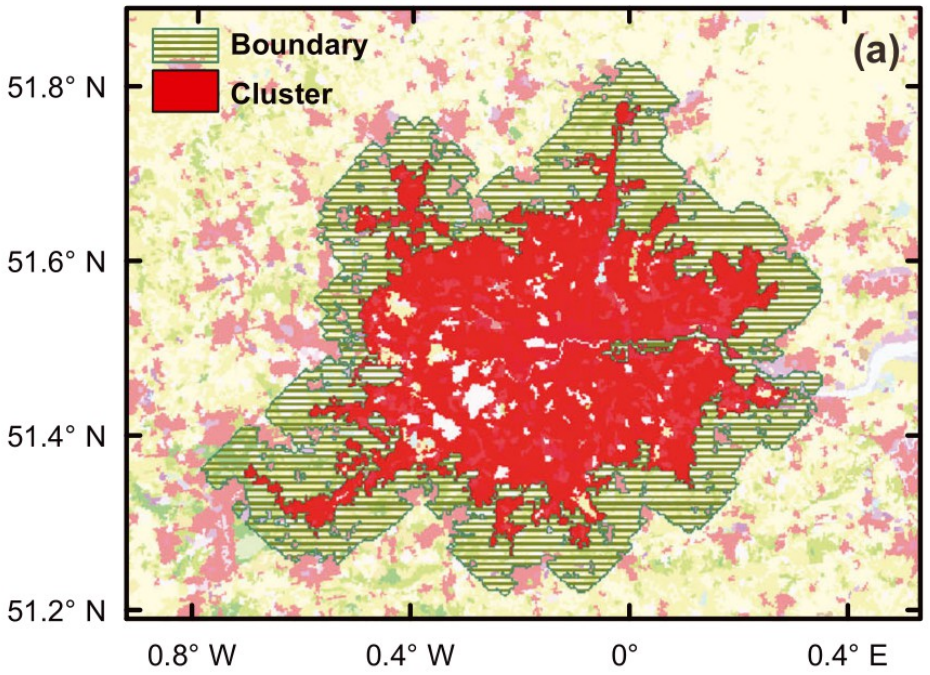
less:
energy
transport
built infrastruc.

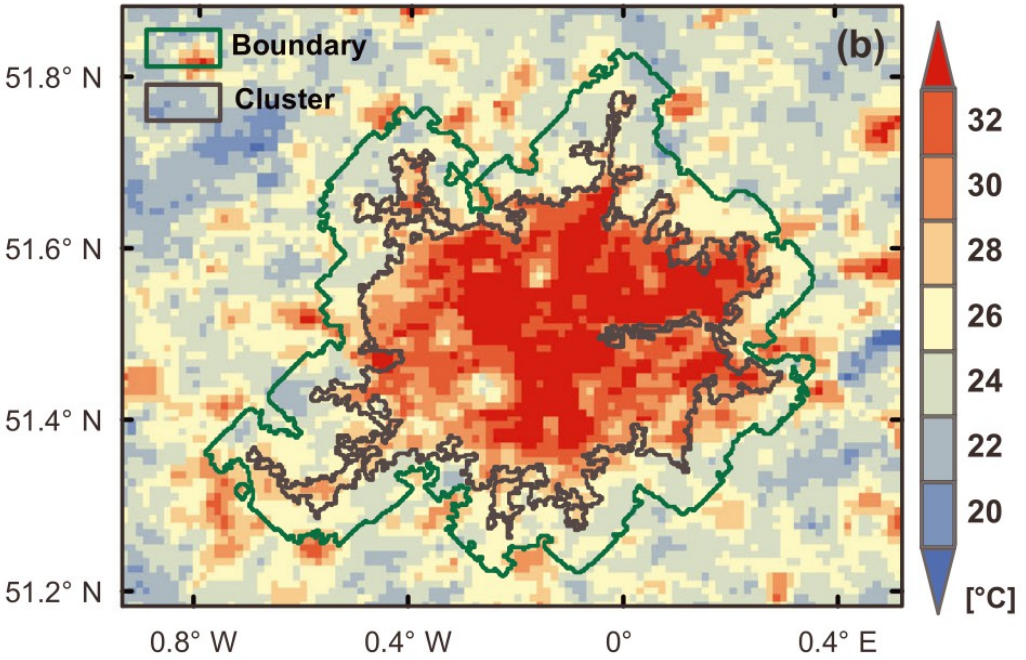
advanced:
London &
New York

Cities have their own climate: e.g. Paris



Urban Heat Island: Zhou, GRL, 2013





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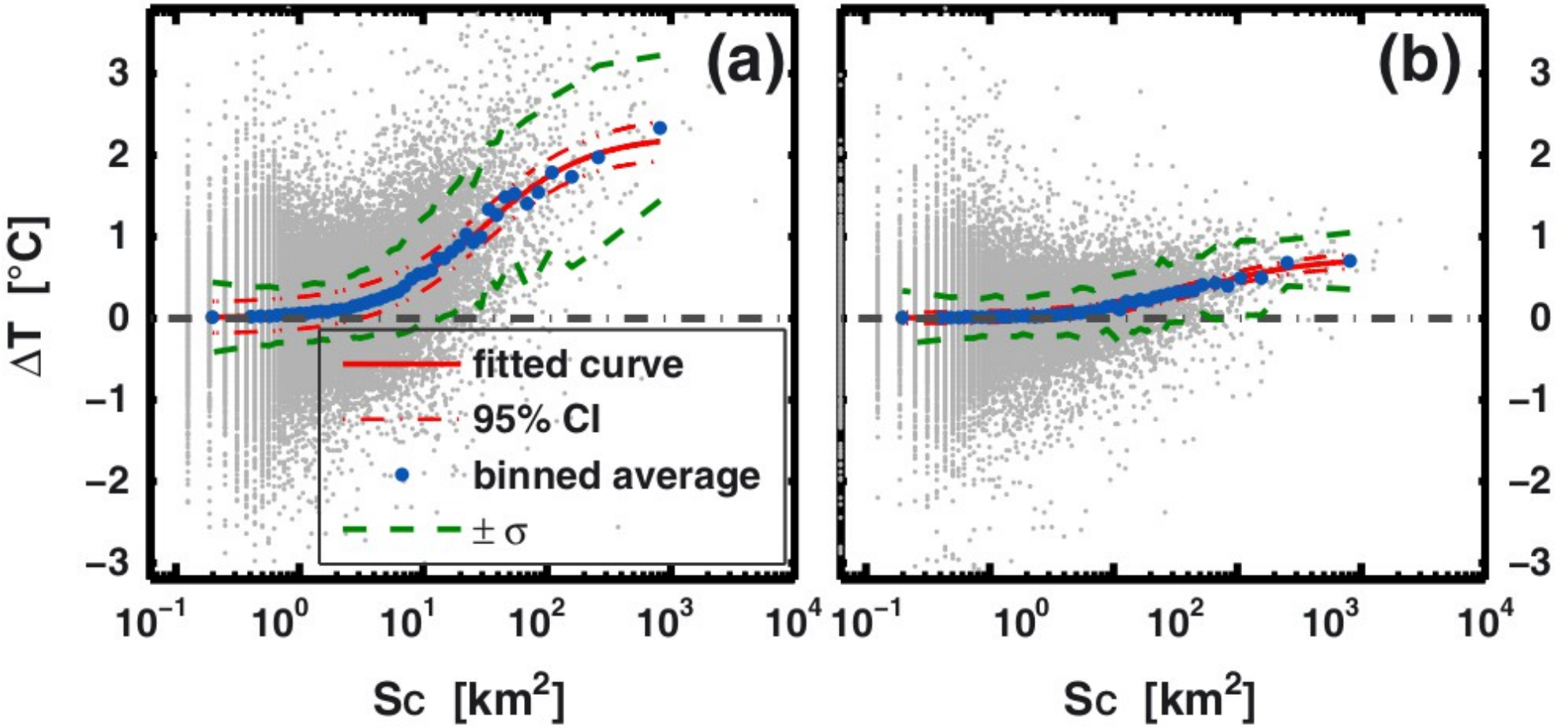
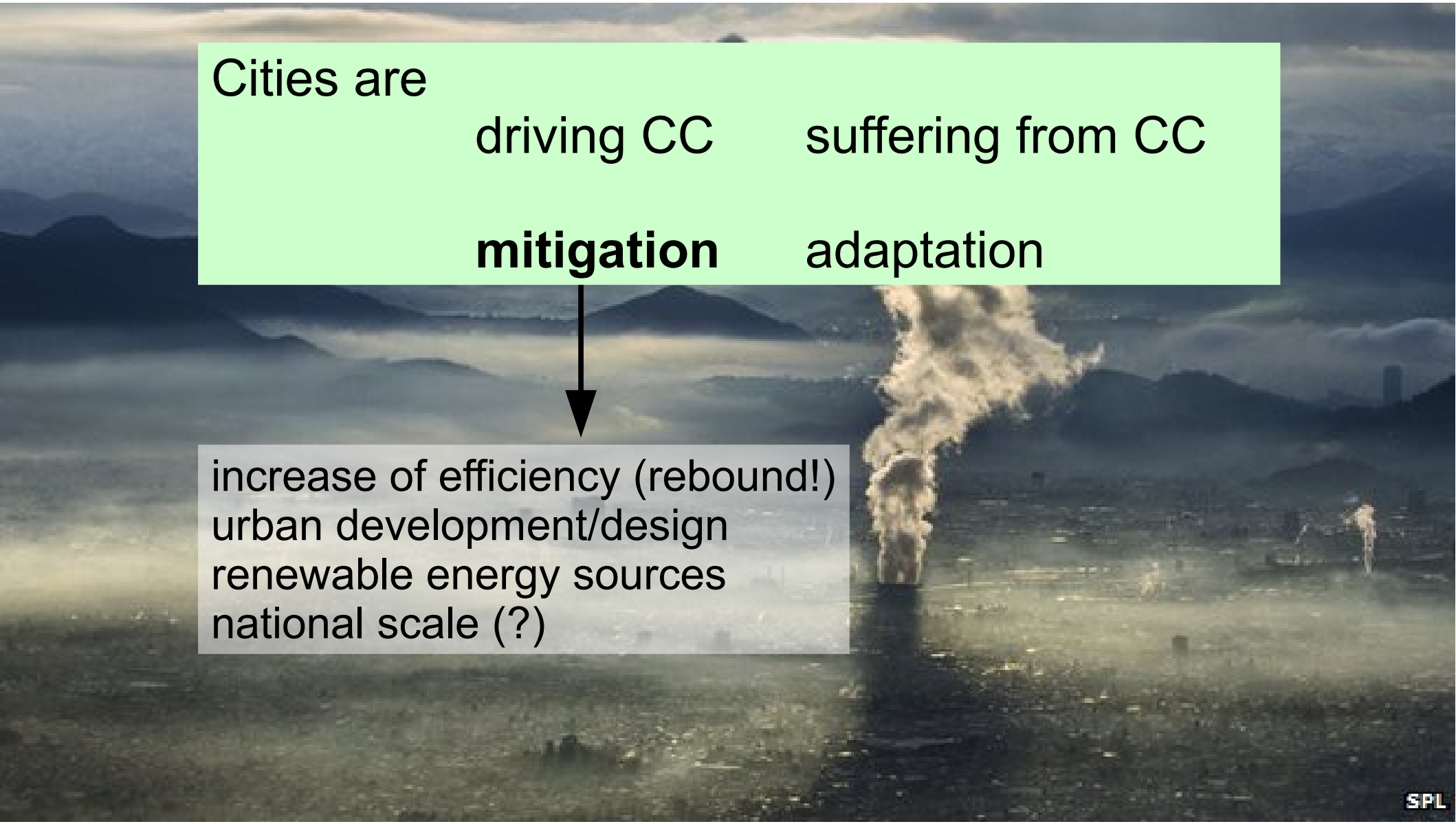


Cities in the climate change (CC) complex



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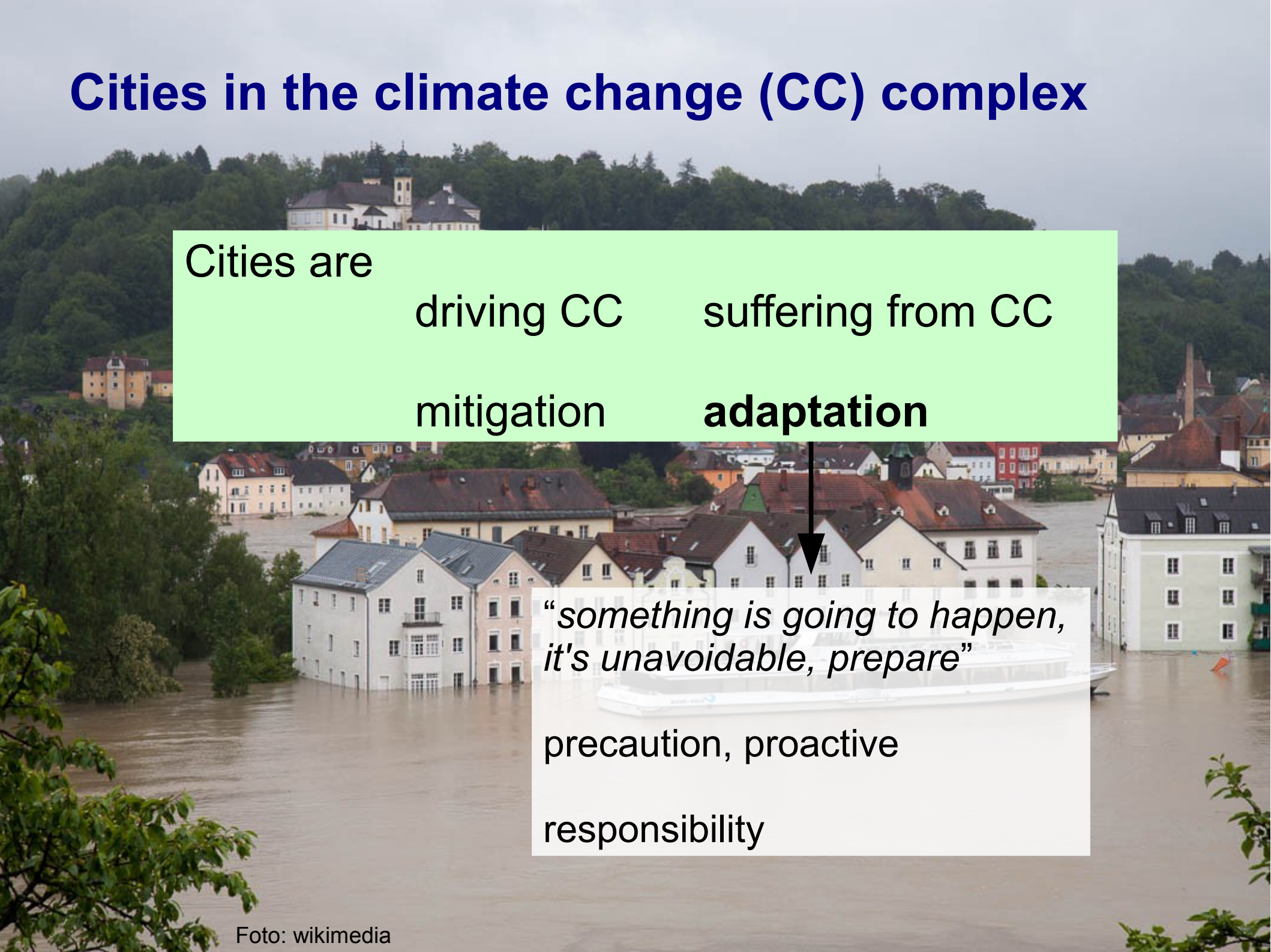

Cities are

driving CC suffering from CC

mitigation **adaptation**

"*something is going to happen, it's unavoidable, prepare*"

precaution, proactive

responsibility

Foto: wikimedia

Climate change adaptation: some thoughts

- Cost-benefit analysis
  - investment costs vs. avoided damages
  - time frame / amortization
  - precise estimation of upcoming damage required
- Most impacts are due to natural disasters
  - attribution, what is the base-line?
- Uncertainty
  - about frequency and intensity future development
  - about losses
- Some impacts cannot be avoided completely
  - probability can only be reduced
- Relabeling
  - double-win
  - term adaptation overused

Climate change adaptation: some thoughts

There is no “one size fits all”
- city, impact, adaptation option

Intangible damages
- beyond monetary

Competing interests
- actors

Time frame
- implementation vs. effect

Impacts take place on local scale
- **Cities need to be general actors of adaptation strategies**

Epilog: No Regrets Charter

Holistic view (politics, ecology, economics, culture)
→ don't forget about the practitioners

“Why we need principles for climate change adaptation in cities”
→ “Principles for climate change adaptation in cities”

Epilog: Ramses project

RAMSES
Science for cities in transition

RAMSES stands for
Reconciling **A**daptation, **M**itigation and **S**ustainable Development for citi**ES**

The main aim of this research project is to deliver much needed quantified evidence of the impacts of climate change and the costs and benefits of a wide range of adaptation measures, focusing on cities. RAMSES will engage with stakeholders to ensure this information is policy relevant and ultimately enables the design and implementation of adaptation strategies in the EU and beyond. The project will focus on climate impacts and adaptation strategies pertinent to urban areas due to their high social and economic importance.

http://www.ramses-cities.eu/

The work leading to these results has received funding from the European Community's Seventh Framework Programme under Grant Agreement No. 308497 (Project RAMSES - Reconciling Adaptation, Mitigation and Sustainable Development for Cities).

Epilog: Ramses project

Thank you for your attention

http://diego.rybski.de/

http://www.pik-potsdam.de/members/rybski/