Climate change and cities

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Cities as drivers of environmental change
Large cities: are they sustainable?

Energy

Raw materials

Water, food

Gaseous waste

Solid waste

Liquid waste

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Cities as drivers of climate change

- Today, more than 50% of the world’s population lives in urban areas
- The increase in the number of urban dwellers is accelerating
- These concentrations of population result in high levels of resource-use (industry, transportation, heating/cooling of buildings, etc.)
- According to UNEP, cities collectively account for 75% of global greenhouse-gas emissions
- In addition, high levels of air pollution lead to other impacts (e.g., the «Asian Brown Cloud») that directly or indirectly contribute to a changing climate
Vulnerability of cities to climate impacts
Coastal vulnerability by 2100

Loss of coastal biodiversity

Populations affected
- > 50 million
- 10–50 million
- region boundary

Source: IPCC, 2001
Water availability

Japan
Spain
India
Haiti

m³/person/annum

2000
2050, without climate change
2050, with climate change

IPCC, 2007

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Changes in cereal yields (2080 vs 2003)

Source: Cline W., 2007, Global Warming and Agriculture.
Mortality in Paris during the 2003 heat wave

Fouillet et al., 2006: Env. Health

°C

Mortality (with respect to the norm)

Tmax

Tmin

July 22
August 1
August 11
August 21
August 31

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Likely tendencies for extreme events

- Heat waves
- Droughts/fires
- Floods
- Storms and hail
- Wind storms
- Damaging frosts
- Slope instabilities
Tropical storms

Pressure at center of system [hPa]

Number of events

- Cat 3
- Cat 4
- Cat 5

1961-1990
2071-2100

K. Emmanuel, Science: 2006
Where we should be heading…
Cities and climate change: solutions through sustainability?

- In large cities that are the major global sources of $\text{CO}_2$, emission abatement will require:
  - Efficient energy technologies
  - Strict pollution controls
  - Efficient urban public transportation systems
  - Low-energy building codes
  - Parks and green roofs to reduce the urban heat-island effect
  - ....
Cities and climate change: solutions through sustainability?

- The industrialized world has the technology to implement such ideas… but does the political will exist?

- What will be the role of the megacities in developing countries that are expected to include over half the world’s population within the next 25 years?

- Whatever future policies are implemented, large cities will be the « privileged » arena for human-climate interactions
  - Cities as a prime source of the global warming problem,
  - Cities as major victims of the negative impacts of climatic change…
Many thanks for your attention!

www.unige.ch/climate
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