Urbanization and Global Environmental Change: Seeking a better understanding of a complex problem

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Executive Director IHDP
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Global Environmental Change

The set of biophysical transformations of land, oceans and atmosphere, driven by an interwoven system of human and natural processes.

Global environmental changes are intimately connected with processes of socio-economic and cultural globalisation.
Often cited examples of ongoing changes in the Earth System
More examples ...
WHY Urban Areas?

- > 50% of world population
- 19 mega-cities > 10 Million people
- 22 cities with 5 to 10 million people
- 370 cities with 1 to 5 million people
- 433 cities with 0.5 to 1 million people

Source: UNCHS 2002
Urban Population as Percentage of Total Population

<table>
<thead>
<tr>
<th>Region</th>
<th>1970</th>
<th>2000</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICA</td>
<td>45%</td>
<td>55%</td>
<td>65%</td>
</tr>
<tr>
<td>ASIA</td>
<td>25%</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>CENTRAL AMERICA</td>
<td>25%</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>EUROPE</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>NORTH AMERICA</td>
<td>45%</td>
<td>55%</td>
<td>65%</td>
</tr>
<tr>
<td>SOUTH AMERICA</td>
<td>35%</td>
<td>45%</td>
<td>55%</td>
</tr>
</tbody>
</table>
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Megacities 2015

• 2002: 394 Mio. people, of these: 246 Mio. in developing countries, oder 215 Mio. in Asia; in the year 2015: 604 Mio. worldwide
• Population data tripled between 1970 and 2000: e.g. Mexico City, São Paulo, Seoul, Mumbai, Jakarta, Teheran
Urban Areas

- Rapid and unbalanced growth
- Problems aggravated in developing countries by economic and financial crises
- Highest growth rates in medium sized cities
- Problems of fast growth: cities are increasingly subject to dramatic crises
- New urban population ≈ poor urban population
Poverty is urbanizing

- Of 37 million new poor created between 1986 and 1996, 31 million were urban — that's five out of six.
- If poverty incidence remains unchanged, almost 70% of the region's poor will soon be in urban areas.

Poverty Incidence varies from 1.7% to 77.3% across neighborhoods of Sao Paulo
• **highest vulnerability and risks** (number of people, leading political centre, economic **networks** and dependencies, widest spectrum of socio-economic **disparities**, serious gaps in public utilities, social **fragmentation**, socio-cultural **conflicts** - consequences: **supply shortages** affect (often: poor) people, etc.)
- limited steering capabilities and partial loss of governability: weak administration and planning
Urbanization and Global Environmental Change

- Unemployment
- Environmental degradation
- Deficiencies in urban services and adequate housing
- Deterioration of existing infrastructure
- Lack of access to key resources
- Violence
- Social exclusion

Urban Areas

- Only Crisis?

Also Solutions?

- Driving forces in economic growth (80% of future growth)
- Reference points for today's globalization
- Nexus of commerce & gateways to the world's economy
- Potential for efficient use of infrastructure and resources
- Natural place for intervention to change production and consumption patterns to reduce their adverse effects on GEC
- Local action with global effect (esp. in Megacities)
- Driving forces for economic growth and social well-being
Urban areas are also driving forces for economic growth and social well-being. In the Developing World, as much as 80 per cent of future economic growth will occur in urban areas (World Bank 2000).
• **highest chances and dynamics** (spatial and demographic growth, land use changes, globalization, networks, economic spectrum, capital market, informal sector, opportunities, ecological sustainability, governmental efficiency, rentability, public transportation, innovation, creativity, etc.)
Urban Areas

- A dominant factor in the world's social, economic, cultural, political, and environmental matrix

- Complex and dynamic systems that reproduce within their territory the interactions among socioeconomic, geopolitical, and environmental processes at local, regional, and global scale.

- Many of the most important and significant changes associated with the impact of both economic globalization and global environmental change (GEC) are taking place in urban areas.
Interactions between urban areas and global environmental change (GEC) understudied

**Emphasis** on impacts originating in urban areas that have a negative effect on GEC (e.g. emissions, heat-islands)
Interactions between urban areas and global environmental change (GEC) understudied:

- Emphasis on impacts originating in urban areas that have a negative effect on GEC (e.g. emissions, heat-islands)

- Less attention to GEC that have a negative effect on urban areas (e.g. impacts on socioeconomic situation, health of the people who live in cities)
Climate Change, Sea Level Rise and Megacities on the Coastal Zone

Source: CIESIN 2001
Aggravating Factors

Incomplete urbanization and poor sanitation are breeding ground for disease organisms and vectors

- Sewage collection/treatment
- Waste collection/treatment
- Drinking water (quality and distribution)
- Urban growth in flood prone areas

Temperature and Precipitation Increase

Vector-Borne Diseases
- Malaria
- Dengue
- Yellow Fever
- Encephalitis

Heat Related Morbidity and Mortality
- Cardiovascular and respiratory illness

Air Pollution
- Asthma
- ARI

Urban and Housing Conditions
Water supply, distribution and quality

- Changes in precipitation and temperature
- Higher demand of water
- Higher runoffs - lower recharge of aquifers
- Salt intrusion in coastal areas

Aggravating Factors

- Incomplete urbanization
- Low enforcement of planning
- Pollution

- Problems to secure present and future water supply in most urban areas

- Problems to expand water distribution networks, particularly in low-income areas. Impact on the standard of living and income

- Poor and inadequate maintenance in water distribution systems in most cities (25 to 35 percent of the water is lost and risk of contamination of water lines)
<table>
<thead>
<tr>
<th>Year</th>
<th>Disaster type</th>
<th>Location</th>
<th>Deaths</th>
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<tbody>
<tr>
<td>1990</td>
<td>Earthquake</td>
<td>Iran</td>
<td>40,000+</td>
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<tr>
<td></td>
<td>Earthquake</td>
<td>Philippines</td>
<td>1600+</td>
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<tr>
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<td>Tropical cyclone</td>
<td>Bangladesh</td>
<td>130,000+</td>
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<tr>
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<td>Flash floods</td>
<td>Afghanistan</td>
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<td>Flooding</td>
<td>China</td>
<td>1800</td>
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<td></td>
<td>Earthquake/Landslide</td>
<td>India</td>
<td>1600+</td>
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<td>Typhoon</td>
<td>Philippines</td>
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<td>1992</td>
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<td>China</td>
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<td>India, Nepal, Bangladesh</td>
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<td>Heat wave</td>
<td>United States*</td>
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<td>1995</td>
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<td>China</td>
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<td>1997</td>
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<td>Floods/Mudslides</td>
<td>Venezuela*b</td>
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<td>1999</td>
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<td>India</td>
<td>2800</td>
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<td>2000</td>
<td>Earthquake/Mudslide</td>
<td>El Salvador*a</td>
<td>1500</td>
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<tr>
<td></td>
<td>Earthquake</td>
<td>India</td>
<td>35,000</td>
</tr>
</tbody>
</table>

*a Losses primarily within megacity.

*b Losses also major within megacity.

Urban - Rural Interactions
Land Use and Land Cover Change
Global Environmental Change and Urban Areas

Theory and Methods

Vulnerability/Adaptation

Urban Function / Form

Urban and Peri-urban Areas

Natural Disasters

Health and Well-Being

Institutions/ Governance

Geopolitical, Socio-Economic Processes (Global, Regional & Local)

Biophysical Processes (Global, Regional & Local)
Seeking New Approaches
Multi dimensional and Multi scale Processes

Theory / Methods

- Cultural
- Economic
- Social
- Political
- Biophysical
SCALE

Intra urban scale

Household → Neighborhood → City

Transnational, Regional, National, Local Processes

Image of urban landscape and natural disasters.
• Urban Studies
  • Sociology
  • Economy
  • Politics
  • Anthropology
  • Planning
• Environmental Studies
• Political Economy

Human Dimensions of Global Environmental Change

• Climate
  • Urban Climate Impact Studies
• Hydrology
• Ecology
• Geology
• Public Health
New IHDP core project on Urbanization
IHDP Project on Urbanization

„Leitmotiv“:

What are the interactions between GEC and urban processes across spatial and temporal scales and for different social groups

(social groups defined in terms of age, gender, ethnicity, class, migration status, degree of empowerment etc. as appropriate in any particular context)
Special Focus of IHDP Project on Urbanization

- Build better knowledge and understanding of the bi-directional interactions between global environmental change and urban processes that may increase the rate, intensity and scale of urban and environmental change.

- Change may have both positive and negative impacts for different places and groups at different times,

  but

  the extent of potential negative changes represents a substantial challenge to the functioning, stability and sustainability of urban areas.

- Although these changes will be felt in both the global North and South, they will present by far greater threat in the latter.
IHDP Project on Urbanization

- 'Integrative Science': social - natural sciences; fundamental - applied
- Urban areas as part of wider geopolitical, socio-economic processes and environmental systems, operating at various spatial and temporal scales
- Focus on processes
- Focus on people: both the nature of different impacts and possible adaptations and coping strategies
Global Environmental Change

Economic, Political, Social, Cultural Contexts
Knowledge and Values
Preferences

interactions
human actor

interactions
human actor

interactions
human actor
New IHDP core project on Urbanization

Theme 1: Urban Processes that Contribute to Global Environmental Change

Theme 2: Pathways through which Global Environmental Change Affects the Urban System

Theme 3: Interactions and Responses within the Urban System

Theme 4: Consequences of Interactions within Urban Systems on Global Environmental Change
New IHDP core project on Urbanization

Theme 1: Urban Processes that Contribute to Global Environmental Change

Goal: A better understanding of the underlying human and physical processes that contribute to global environmental change

Research Questions:

(1.1) How do lifestyles and consumption patterns within areas contribute to GEC?

(1.2) How does urban land use and land cover change affect GEC?

(1.3) What are the zones of influence of urban systems, and how do these social and biophysical ‘teleconnections’ affect GEC?
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Theme 2: Pathways through which Global Environmental Change Affects the Urban System

Goal: To better understand the pathways through which specific types of global environmental change affects local and regional processes and well being (economic activities, livelihoods, migration patterns, human health)

Research Questions:

(2.1) What are the main processes by which global environmental change affects human behavior and interactions?

(2.2) How do global environmental change contribute to shaping the built environment?

(2.3) How do GECs affect the resource base upon which urban systems rely?
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**Theme 3: Interactions and Responses within the Urban System**

**Goal:** Better understanding of the impact of global environmental change on urban systems and the responses to these impacts within them are shaped by the interactions among its socioeconomic and geopolitical processes and environmental dimensions.

**Research Questions:**

(3.1) How do these interactions between the human and the physical systems shape the impact of global environmental change?

(3.2) How do the interactions between the human and physical systems shape the responses to global environmental change?

(3.3) How do the impacts of global environmental change affect livelihoods in urban communities?
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Theme 4: Consequences of Interactions within Urban Systems on Global Environmental Change

Research Question:

(4) How do the result of interactions within the urban system modify the impacts on various components of global environmental change?
Earth System

Urban Sub-System

**Human/Social Component**
- Population
- Markets & Infrastructure
- Institutions
- Culture

**Biophysical Component**
- Built environment
- Urban-rural land use gradient

Global Environment Sub-System

**Climate Change**
- GHG emissions
- Flooding
- Sea level rise
- SST increase

**LUCC**
- Deforestation
- Salinization
- Desertification
- Agricultural intensification
- Urban expansion

**Biodiversity**
- Species extinction

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Theme 1: Urban processes that contribute to GEC
Theme 2: Pathways GEC affects urban system
Theme 3: Interactions & responses within urban system
Theme 4: Consequences of interactions within urban system on GEC
Objectives of IHDP Project on Urbanization

- **Coordination frame of research**

  **Analysis of:**
  - Interactions between global environmental change and urban processes
  - Rate, intensity and scale of urban and environmental change and mutual impacts
  - Pathways of transformations of urban systems
  - Challenges for sustainability of urban areas

- **Development of conceptual frameworks and methodologies**

- **Translation and communication of scientific research results to decision-makers, practitioners, and other end-users**
New IHDP Core Project on Urbanization

Changing Environment and climate change

Impact Assessment

1. Integration of Impact Studies
2. Integration of Process Analyses
3. Integrated Models and Tools

Feedback Analysis

Urban Processes

Form & Function

Governance & Institutions

People & Social patterns

Process Analysis

THREATS

OPPORTUNITIES
Implementation of IHDP Project on Urbanization

- Cross temporal and spatial approaches and regional comparative analyses
- Emerging foci: carbon, water, health, vulnerability studies, peri-urban landscapes
- Contribution to regional and global integrated models
- Scientific basis for urban planning and management
Thank you for your attention!

For further information: www.ihdp.org