GLOBAL ENVIRONMENTAL CHANGE AND URBANIZATION

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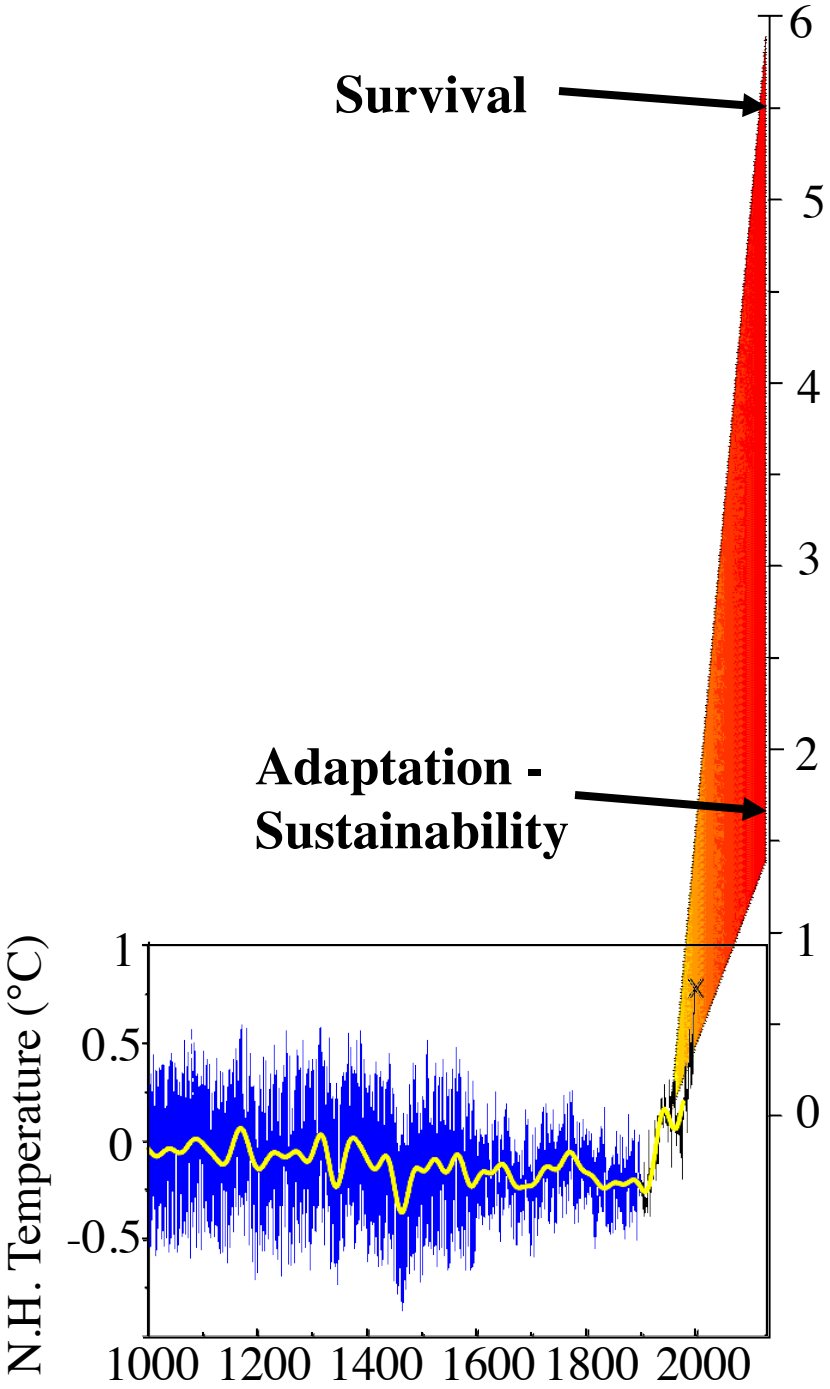
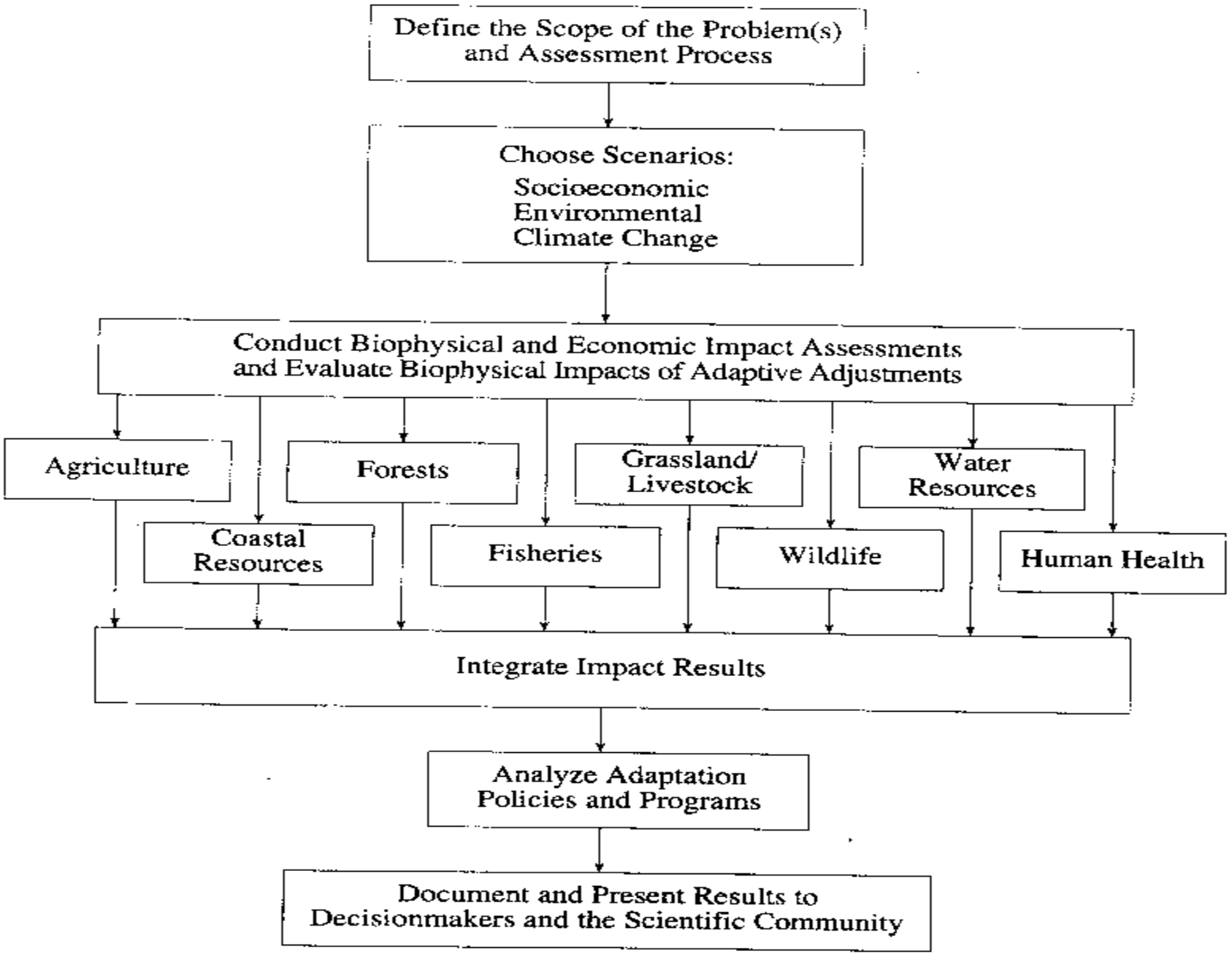


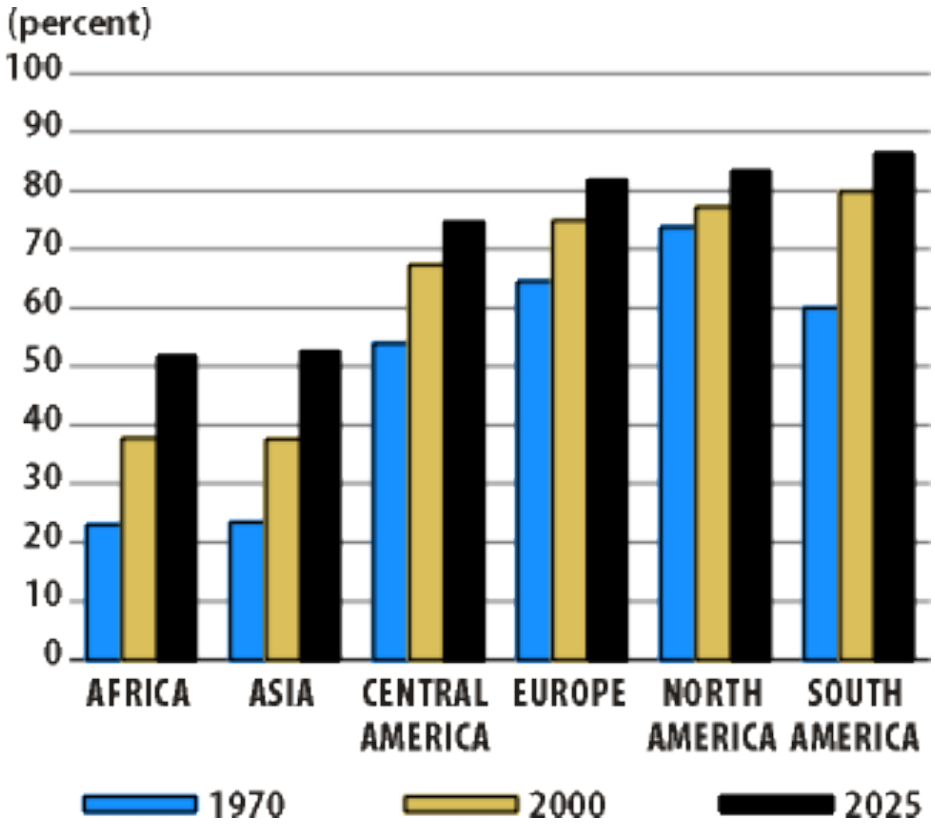
IPCC Projections
2100 AD

PAGES

U.S. Country Studies Program Primary Approach to Climate Change Vulnerability and Adaptation Assessments

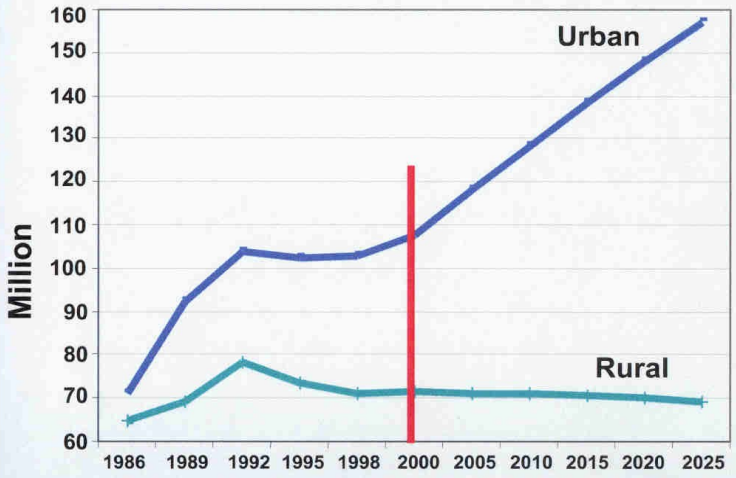


Urban Population



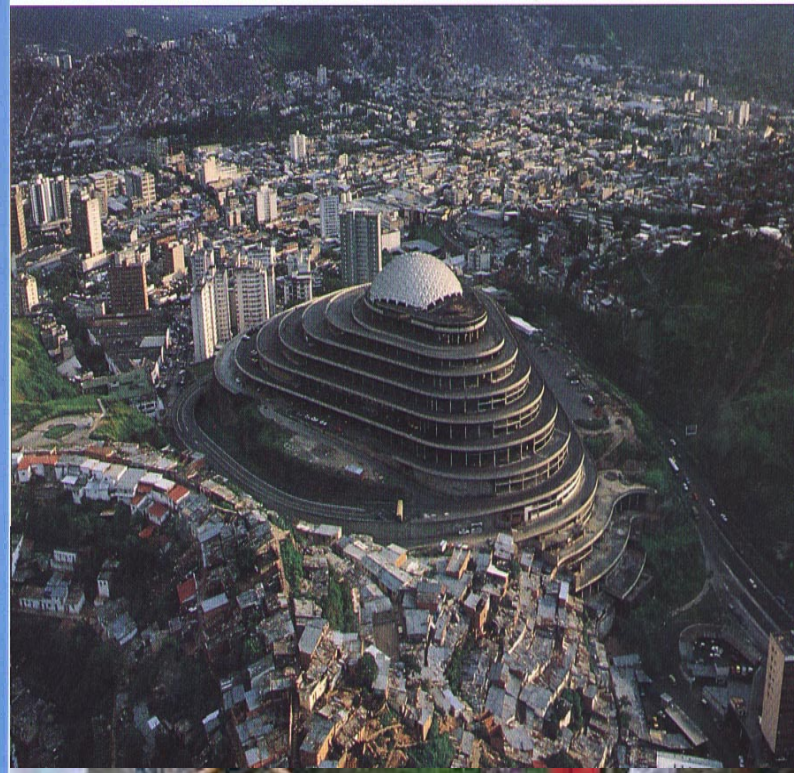
Source: UNCHS 2002

Poverty is urbanizing



- Out of 37 million new poor created between 1986 and 98, 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.

Source: Wodon et al (2001) ; UN (1999). Projections use 1998 poverty rates applied to UN population projections.



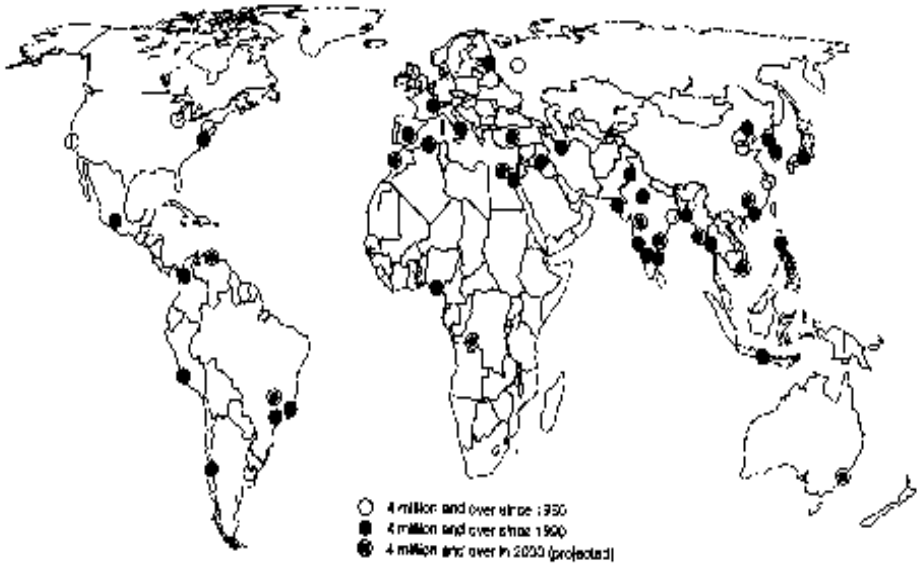
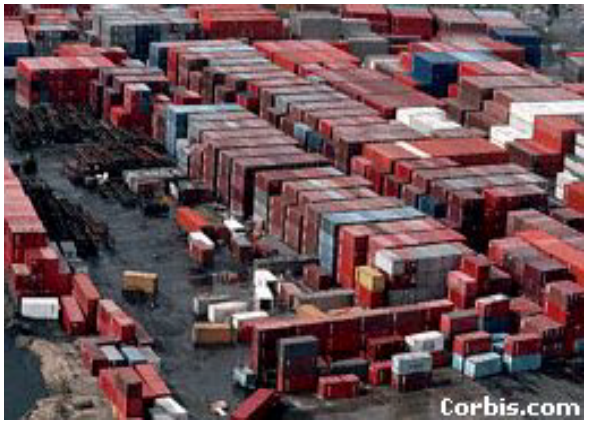
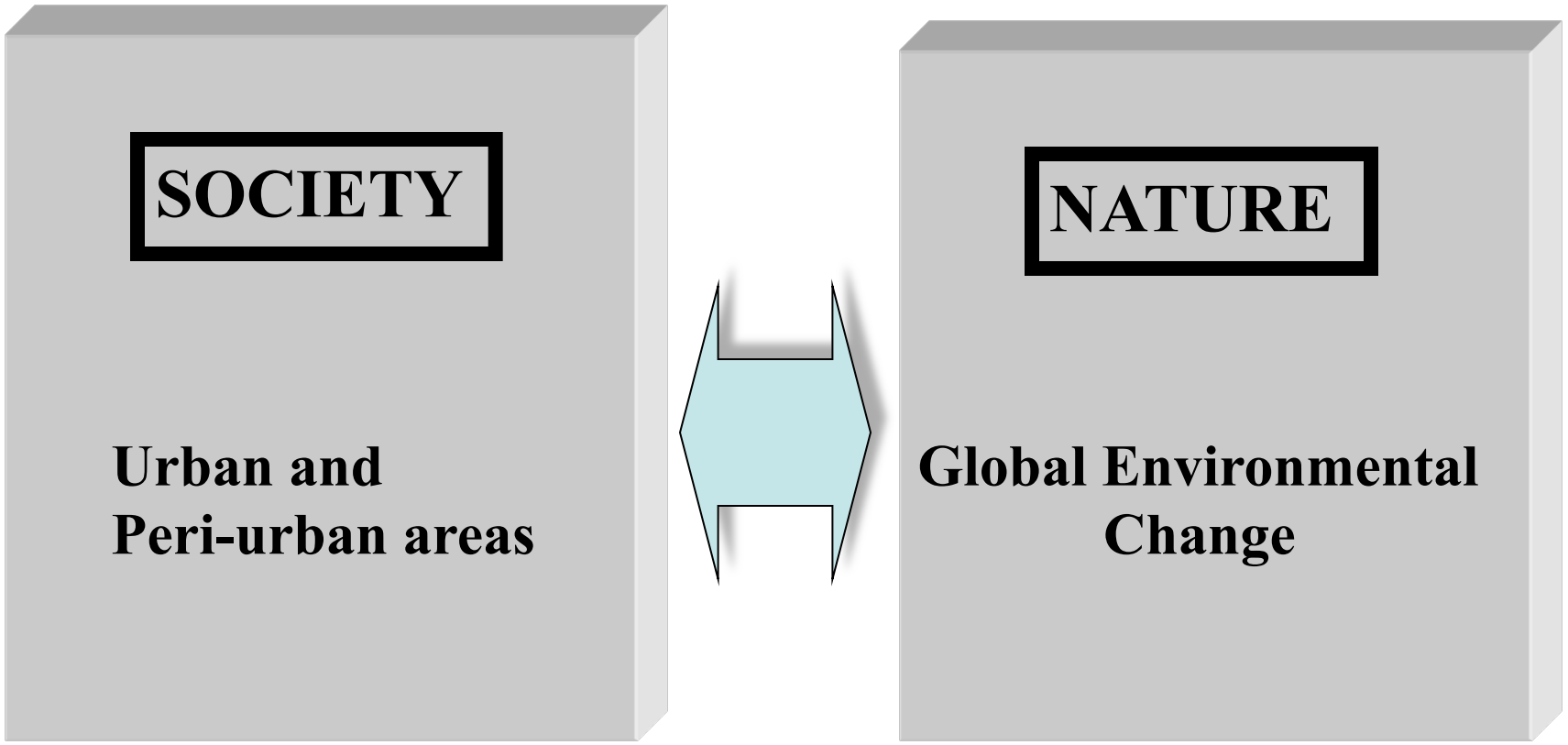


Fig. 1.8 Largest urban areas in the world in 1950, 1990, and 2000. (Source: Population Reference Bureau.)



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).

Las áreas urbanas son sistemas complejos y dinámicos que reproducen en su territorio las interacciones entre processos socioeconómicos, geopolíticos, culturales y ambientales a nivel local, nacional, regional y global.


SOCIETY
Urban and
Peri-urban areas
NATURE
Global Environmental
Change

Rationale

The interactions between global environmental change and urban processes are bi-directional interactions and processes that may increase the rate, intensity and scale of urban and environmental change. Such change may be both positive and negative 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 a greater threat in the latter.

Objectives

This project aims to build better knowledge and understanding of the interactions between global environmental change and urban areas.

- **To assist in the development of conceptual frameworks and methodologies capable of supporting the study and analysis of these interactions**
- **To guide the study of the interactions between global environmental change and urban systems with the ultimate goal of facilitating parallel and comparative cross-study analyses**
- **To identify the points and strength of interaction, the thresholds for change, and the direction of causality in a coupled human-environment urban system**
- **To facilitate the translation and communication of scientific research results to decision-makers, practitioners, and other end-users at the international, national, and local levels in the urban areas around the world**

Approaches To Global Environmental Change

"All too often, experts forget that problems of society do not come in discipline-shaped blocks" (Roy 1979; 165).

"Each discipline sees itself as a perspective of the whole; in these terms it maintains a certain autonomy and its irreplaceable… but each discipline is enabled to give us this access to the world precisely because it is member of a community of representations" Rajan 1998; 3).

"We need to reconceptualize our model of disciplinary growth and specialization, adopting a more organic model that accounts for the intricate links among the many specializations. Our current mechanistic model divides disciplines into numerous blocks of specializations" (Ruscio 1986; 43).

"To overcome the feeling of threat by means of an inwardly felt need for the other point of view is the ultimate goal of interdisciplinary studies. The basic task before such a program is not merely the learning of new concepts and methods, nor merely new ideas and thoughts, but what we have to learn is a new way of thinking" (Giri 2002; 103).

Interdisciplinary Approaches

Socio-Ecological Resilience

"Resilience provides the capacity to absorb shocks while maintaining function. When change occurs, resilience provides the components for renewal and reorganization (Folke et.al. 2002, 9)."

"The complexity of social-ecological systems makes it necessary to abandon the perception of a global steady state. Instead, managing complex coevolving social- ecological systems for sustainability requires the ability to cope with, adapt to and shape without losing options for future development. It requires resilience - the capacity to buffer perturbations, self organize, learn and adapt. When massive transformation occurs, resilient systems contain the experience and the diversity of options needed for renewal and redevelopment. Sustainable systems need to be resilient (Folke et.al. 1998, 28)."

Landscape Planning

“Landscape is more than a scale and a set of interacting ecosystems. It is “a way of seeing the world and imagining our relationship to nature…It is something that we think, do, and make as a social collective” (Wilson 1992;12).

“Since thefate of our landscapes lies so squarely on the lap of society, it is imperative that our research move beyond our traditional descriptions of space, our academic divisions, and our rational methods” (Linehan et.al. 1998; 209).

Systems thinking is essential to ecological planning and design since it provides a method for visually conceptualizing ecological processes into better policies, plans, and physical forms” (210).

“I consider interdisciplinary landscape research as that which attempts to go beyond the level of parallel studies and endeavors to understand the underlying relationships between different subjects and development theory across disciplinary boundaries to gain an transdisciplinary understanding of landscape processes” (Fry 2001; 159).

International Long Term Ecological Research Network

“There is an urgent need to link more effectively with the growing Community of environmental social scientists to create more integrative, Interdisciplinary teams to deepen understanding of the factors determining The vulnerability and resilience of the nature – society system to change. The failure to engage seriously with the social and economic dimensions Of environmental change is probably one of the main reasons why LTER is currently undervalued as a policy research field” (Parr et.al. 2003; 6).

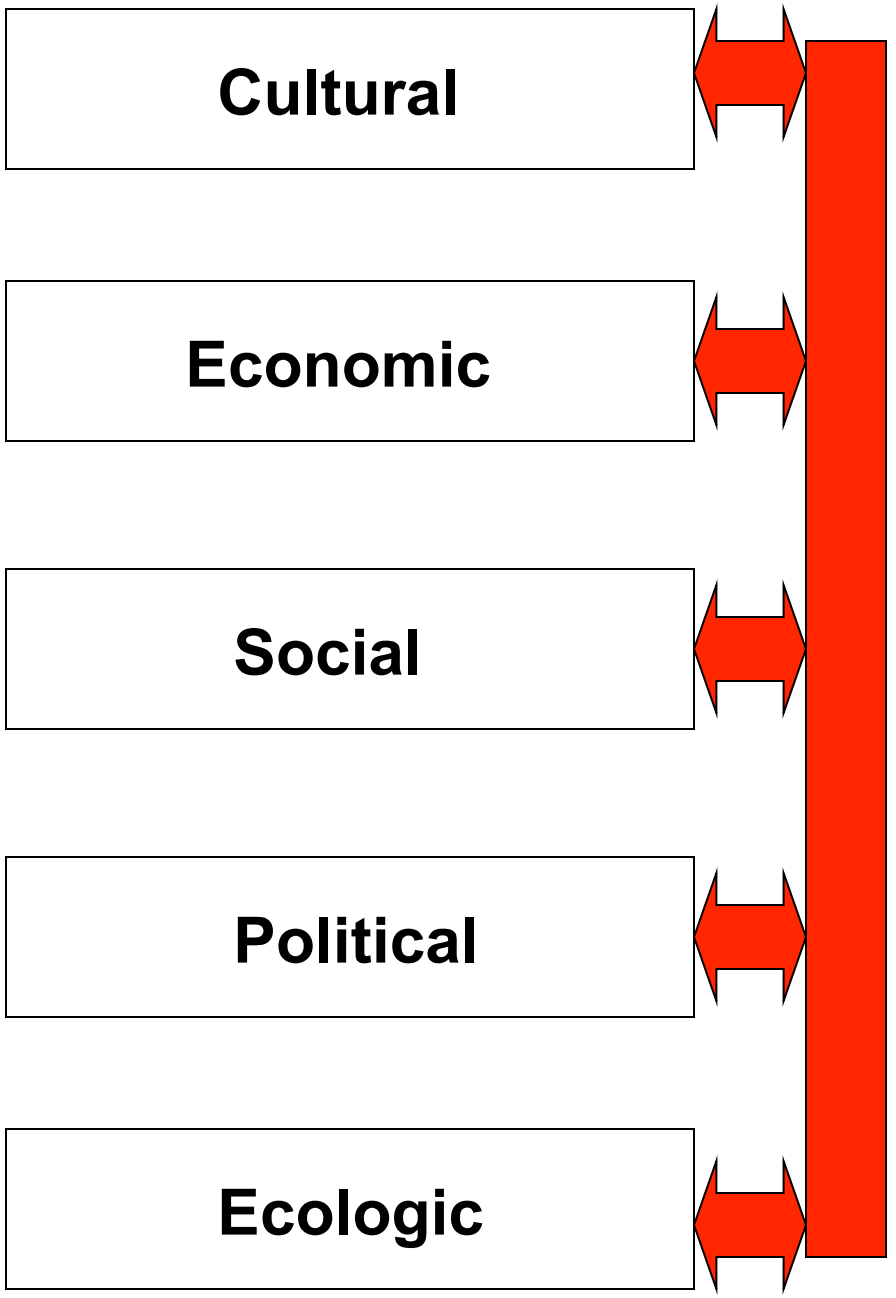
“High quality interdisciplinary science requires skilled disciplinarians who are Curious about theories and methods from other fields” (Heemskerk et.al. 2003;4).

“ In our experience and that of others, collaboration is likely to fail when Scientists communicate poorly, have unrealistic expectations of one another, And internalize prejudices about alien academic fields” (5).

Seeking New Approaches

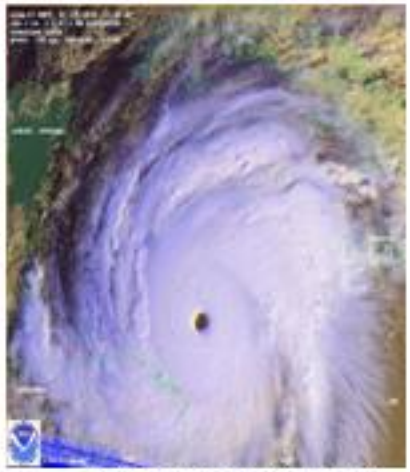
Multi dimensional and Multi scale Processes

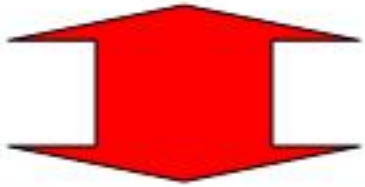
Theory / Methods



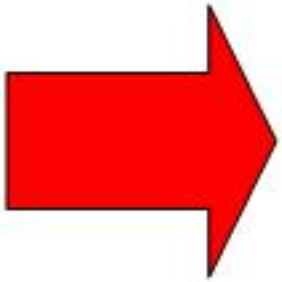
SCALE

Intra urban scale





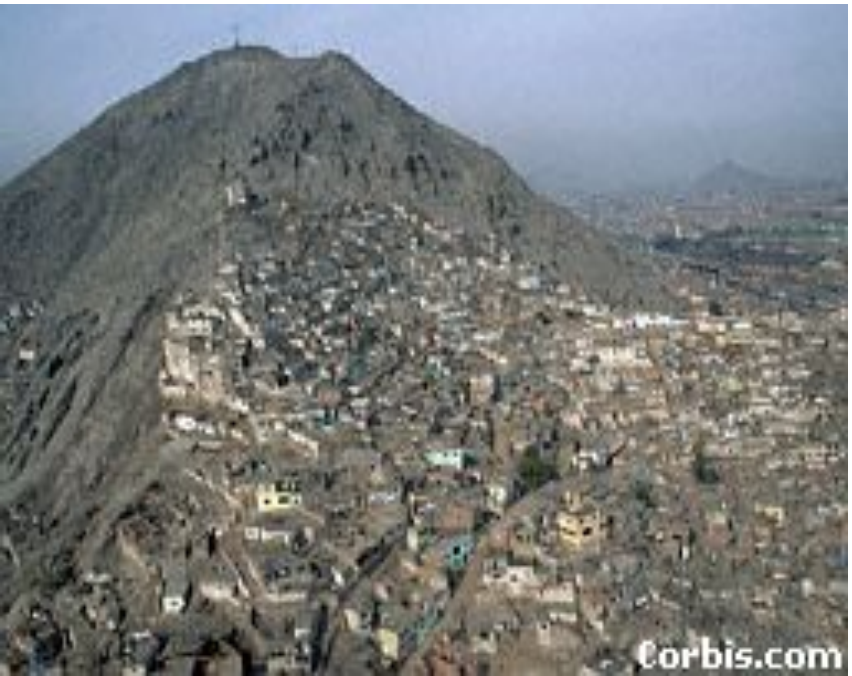
Transnational,
Regional,
National,
Local
Processes



The state has long sought to manage the environment based on the assumption that the environment can be divided into discrete entities for management purpose. It developed as a technocratic problem solving initiative, providing 'practical' assistance to state officials involved in managing environmental problems without any need to modify substantially broader political, economic or social forces (Bryant and Wilson 1998: 7)

Environmental management is a reactive technical response to specific circumstances separating the environmental consequences of growth from social and economic ones (Redclift 1994).

Environmental management treats the environment as a closed self contain system which elements can be modeled and regulated with little interaction from the 'external' economic and political systems (Gibbs and Jonas 2000).



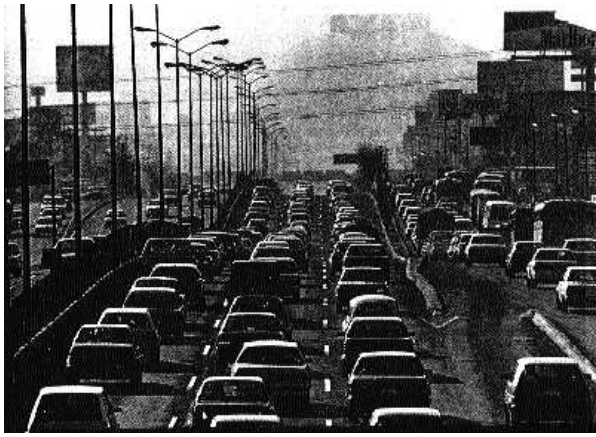
Urbanization Process

- Fragmented and segregated urban space
- Changes in the Urban Economy
- Deficiencies between urban form and urban function
- Deficiencies in urban design and planning
- Incomplete enforcement of urban plans
- Unbalanced urban systems at the regional and national level
- Pressure on peri-urban areas
- Economic crises
- Cuts in social spending (operation and maintenance of public services)
- Deterioration of urban structure
- Violence
- Environmental problems

Habitantes en asentammientos irregulares (000s) en 1990

	Tot Hab	Hab Asen Irre
Lima-	6,234	2,338
Mexico DF	15,783	9,470
Sao Paulo	10,436	3,238
Caracas	2,966	1,238
Bogota	4,824	1,254

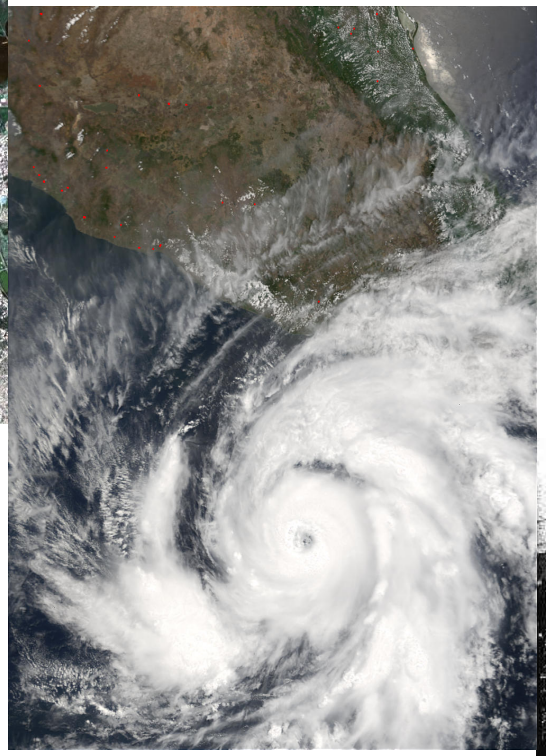
La restricción del acceso al suelo urbano, vivienda y servicios públicos para algunos de los habitantes de la ciudad es la combinación de la creciente desigualdad social, el crecimiento de la pobreza, la acción del mercado inmobiliario, los sistemas políticos y legales y la planeación urbana (Hull 1999).

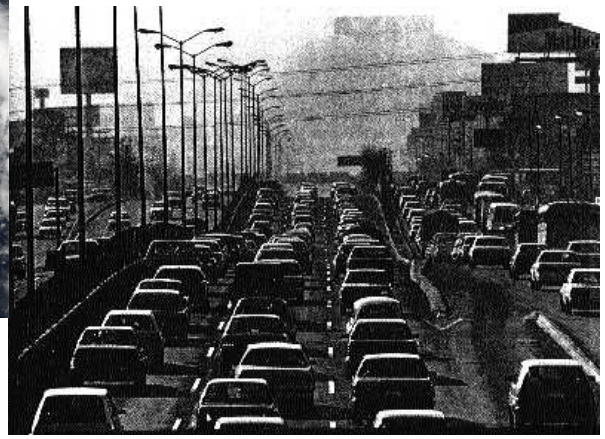


The Challenge of Global Environmental Problems

Mega cities in developing countries Already face significant environmental problems

- Indoor and Outdoor air pollution
- Water supply, distribution and quality
- Solid waste
- Sewage
- Hazardous waste
- Drainage
- Environmental disasters





The Interactions between Climate Variability-Global Climate Change and Urban Areas

Exposure to Extreme Climatic Events

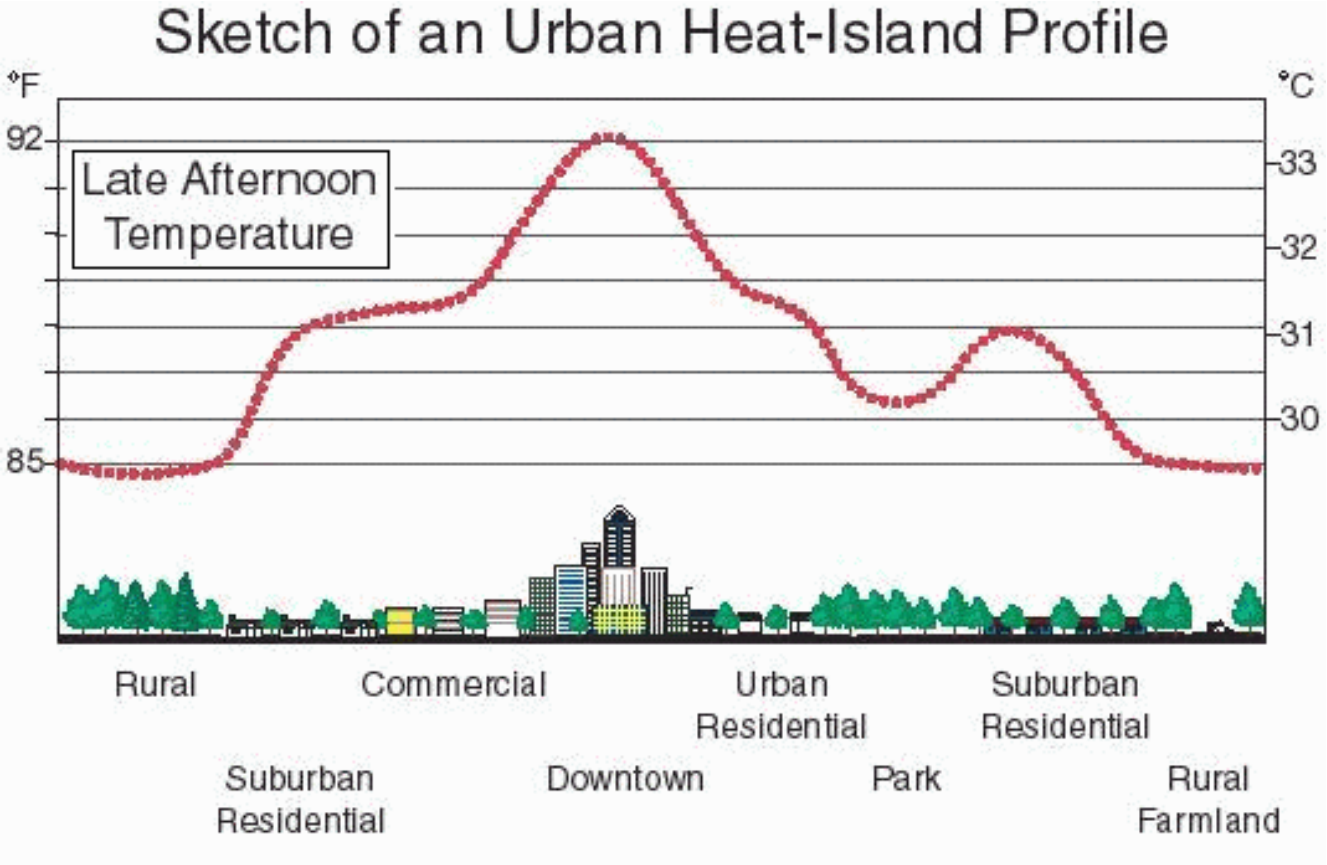
Heat Island


Long Island Sound
New York City

30.7
30.66
26.69
38.9
32.77
32.77
32.77
29.44
29.14
29.85
26.69

Corbis.com

Heat Island Effect

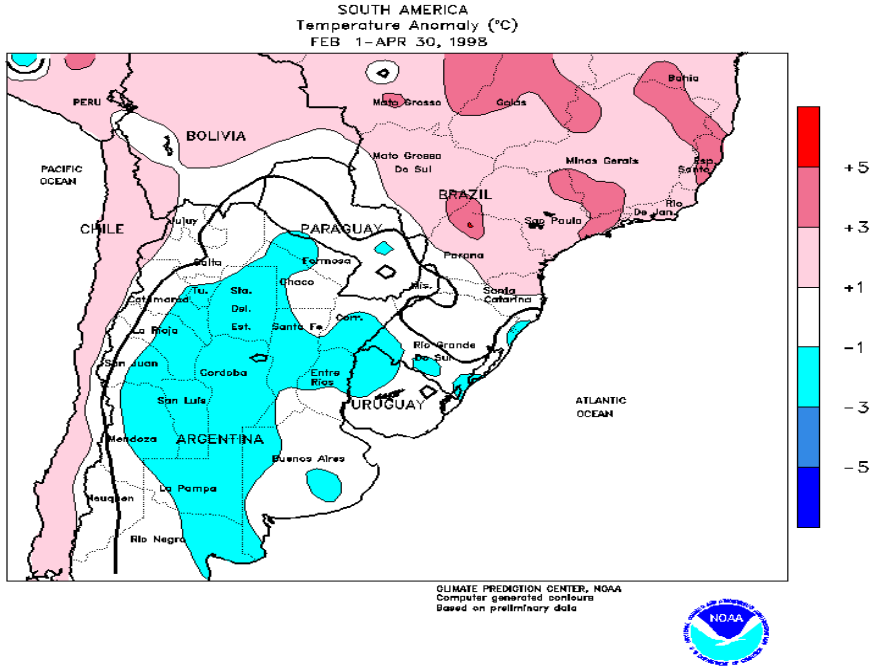


Late afternoon temperature profile for a summer day showing urban-suburban differences.

Source: Lawrence Berkeley National Laboratory, Heat Island Group.

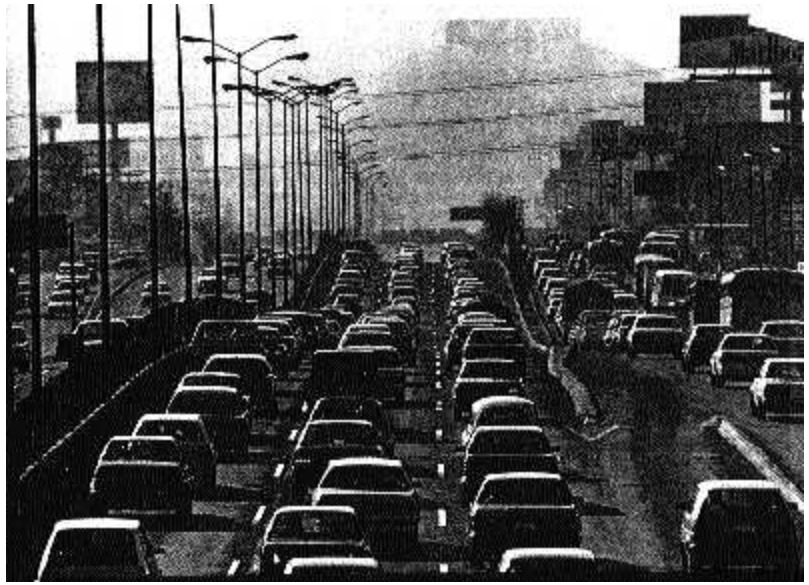
AIR POLLUTION

•Higher temperatures
• Higher levels of troposphere ozone
    • Health consequences



Aggravating Factors

• Severe air quality problems already existing in Mexico City, Santiago, Sao Paulo, Rio de Janeiro and other cities



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)

Temperature / Precipitation - Health Consequences

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

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

Urban and Housing Conditions

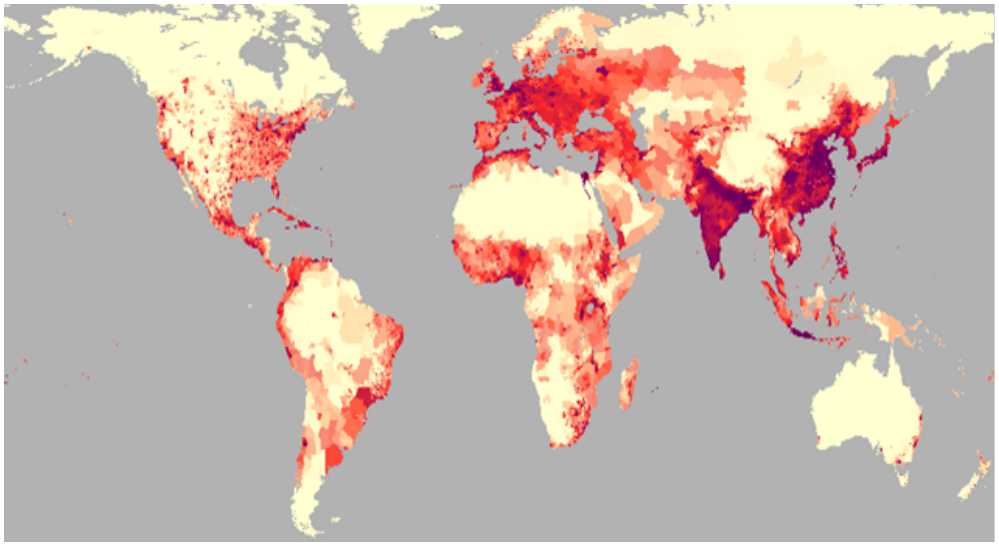
Temperature and Precipitation Increase

- Vector- Borne Diseases → Malaria, Dengue, Yellow Fever, Encephalitis
- Heat Related Morbidity and Mortality → Cardiovascular And respiratory illness
- Air Pollution → Asthma and ARI

URBAN LIFE

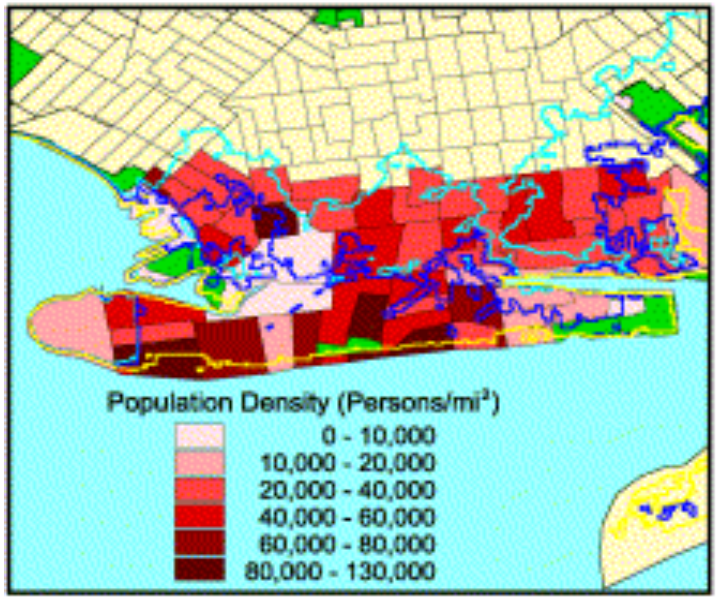
Urban Function
Urban Economy
Social Interaction
Social Well-being
Urban Politics
Urban Ecology

Sea Level Rise



Source: CIESIN 2001

(a)



Coney Island, NY

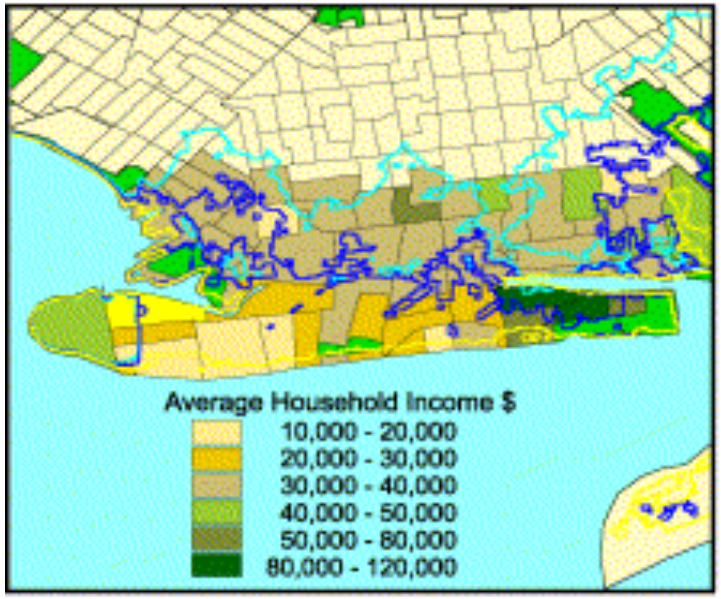
Population and Property at Risk

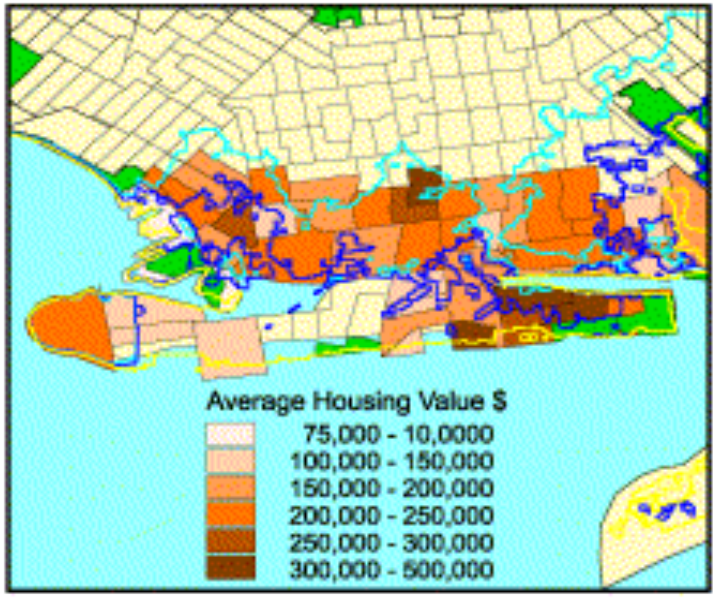
1 0 1
Miles

N
W E
S

Contours in Feet
5
10
15

Data Sources:
1995 Tiger Files
1990 US Census Demographics
Contours Interpreted from USGS 30 Meter DEM's





Source: CIESIN

Source: Gortniz et.al. 2001

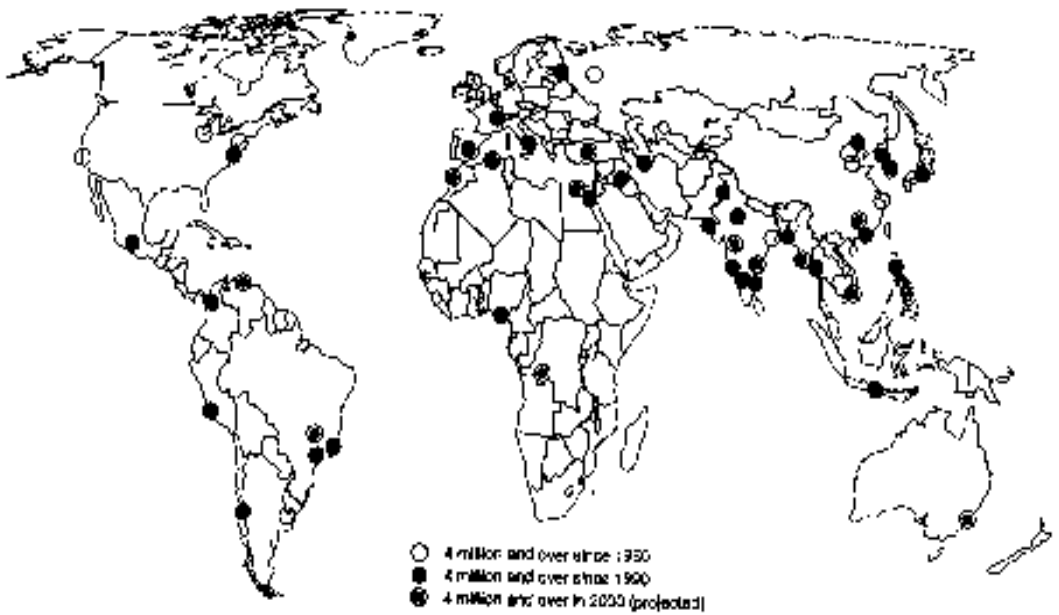


Fig. 1.8 Largest urban areas in the world in 1950, 1990, and 2000. (Source: Population Reference Bureau.)

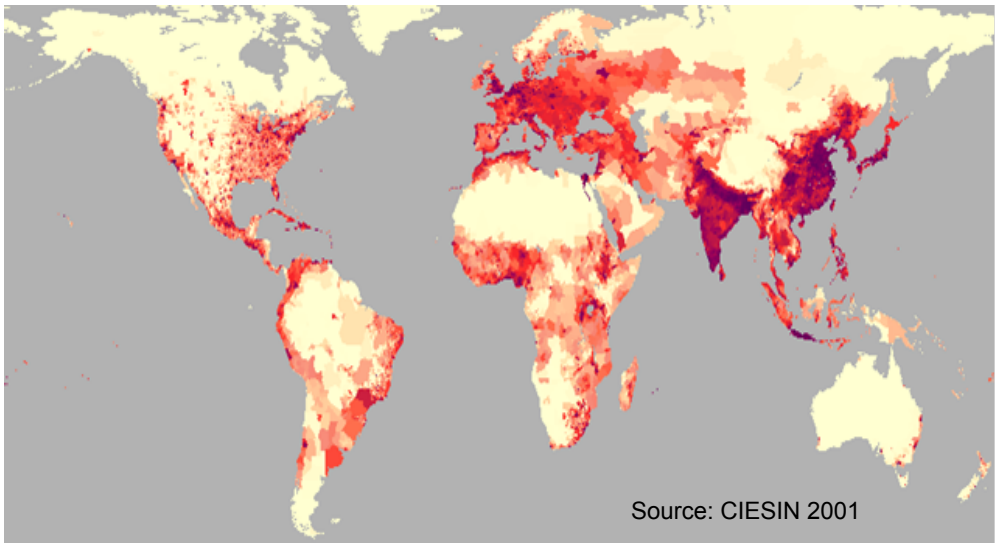


Table 1
Major natural disasters (with over 1000 deaths) since 1990

Year	Disaster type	Location	Deaths
1990	Earthquake	Iran	40,000 +
	Earthquake	Philippines	1600 +
1991	Tropical cyclone	Bangladesh	130,000 +
	Flash floods	Afghanistan	5000
	Flooding	China	1800
	Earthquake/ Landslide	India	1600 +
	Typhoon	Philippines	6000
1992	Floods	China	1000 +
	Flash floods	Afghanistan	3000
	Floods	India, Pakistan	2500 +
1993	Floods	India, Nepal, Bangladesh	1000 +
	Earthquake	India	9700
1994	Typhoon	China	1000
1995	Earthquake	Japan[a]	6000
	Earthquake	Russia	2000
	Flooding	China	1200 +
	Heat wave	United States[a]	1000
1996	Monsoon floods	China	2000
	Tropical cyclone	India	1600
1997	Earthquake	Iran	1560 +
	Flooding	East Africa	2000 +
	Typhoon	Vietnam	3600
1998	Earthquake	Afghanistan	4500
	Flash floods	Pakistan	1800
	Heat wave	India	2500
	Flooding	China	3656
	Monsoon floods	Bangladesh	1000 +
	Tsunami	Papua New Guinea	2500
	Floods/Landslides	India	1000 +
	Hurricane/ Flood/Slides	Honduras, Nicaragua, etc.	10,000 +
1999	Earthquake	Columbia	1000 +
	Earthquake	Turkey[b]	17,000
	Earthquake	Taiwan	2300
	Tropical cyclone	India	9463
	Floods/Mudslides	Venezuela[b]	30,000
2000	Floods	India	2800
2001	Earthquake/Mudslide	El Salvador[a]	1500
	Earthquake	India	35,000

[a] Losses primarily within megacity.
[b] Losses also major within megacity.
Sources: Encyclopaedia Britannica (1991–2001), Book of the Year, Gupta et al. (2001) and IFRCRCS (1999, 2000).

POLLUTION AND WASTE

AVAILABLE ENERGY AND MATERIAL (ESSERGY)

FINAL PRODUCTS

DEGRADED AND DISSIPATED ENERGY/MATTER (WASTE)

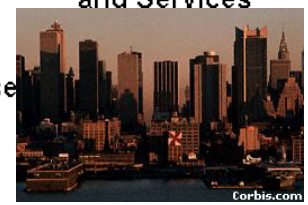
Goods and Services

LOW ENTROPY

HIGH ENTROPY

$

Spending on Goods and Services



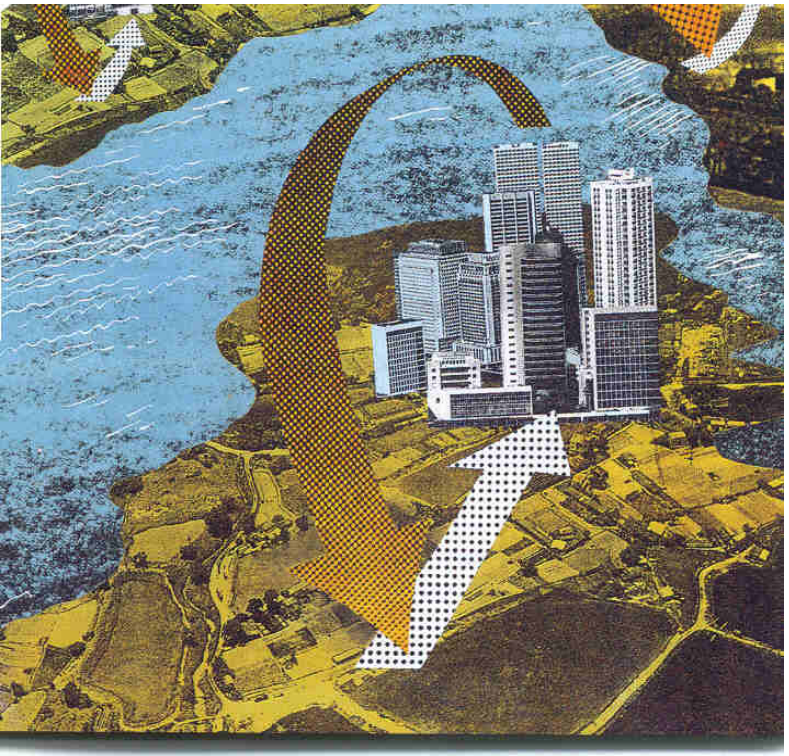
Businesse

Households

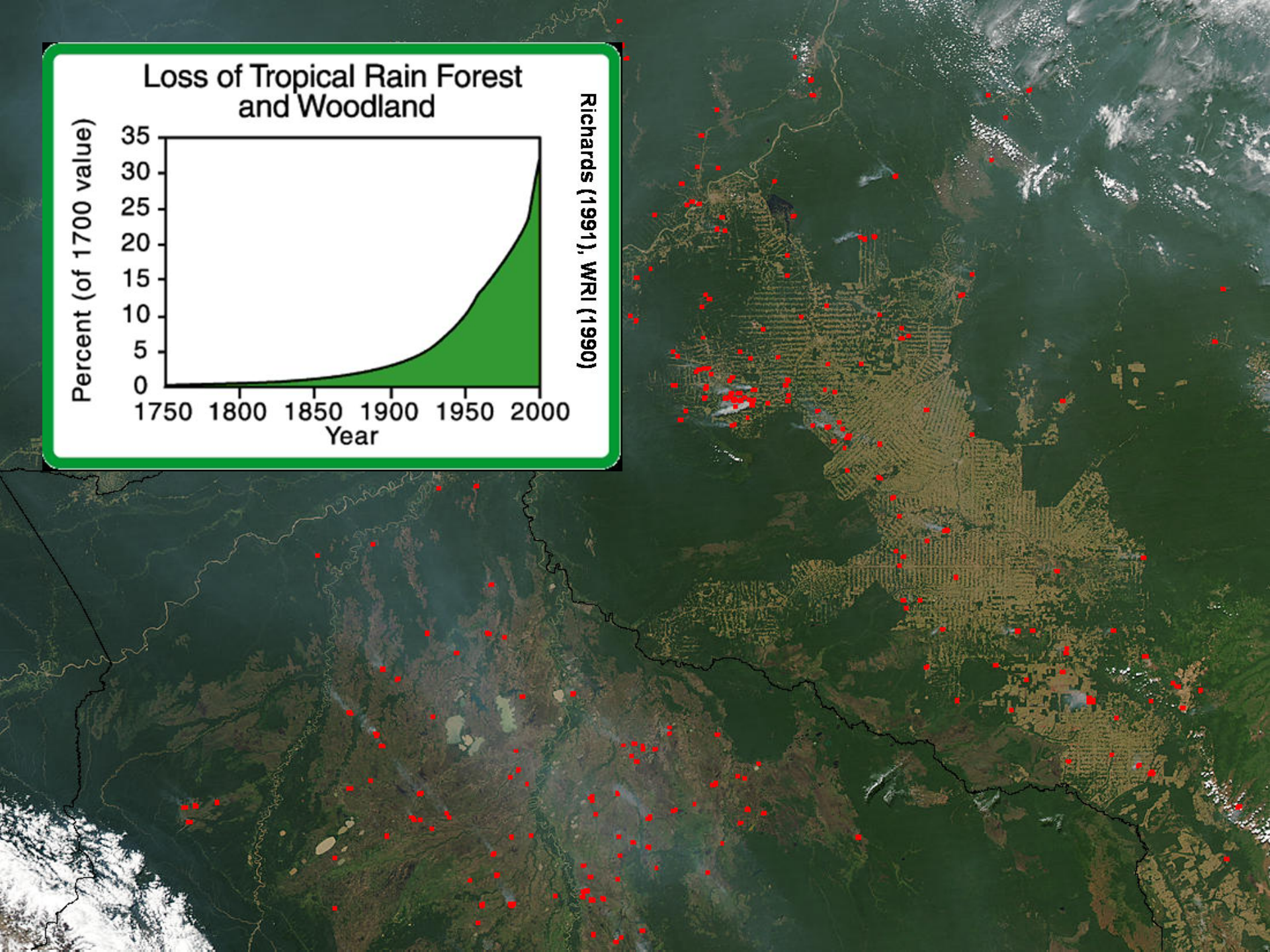
Wages, Salaries, etc.

$

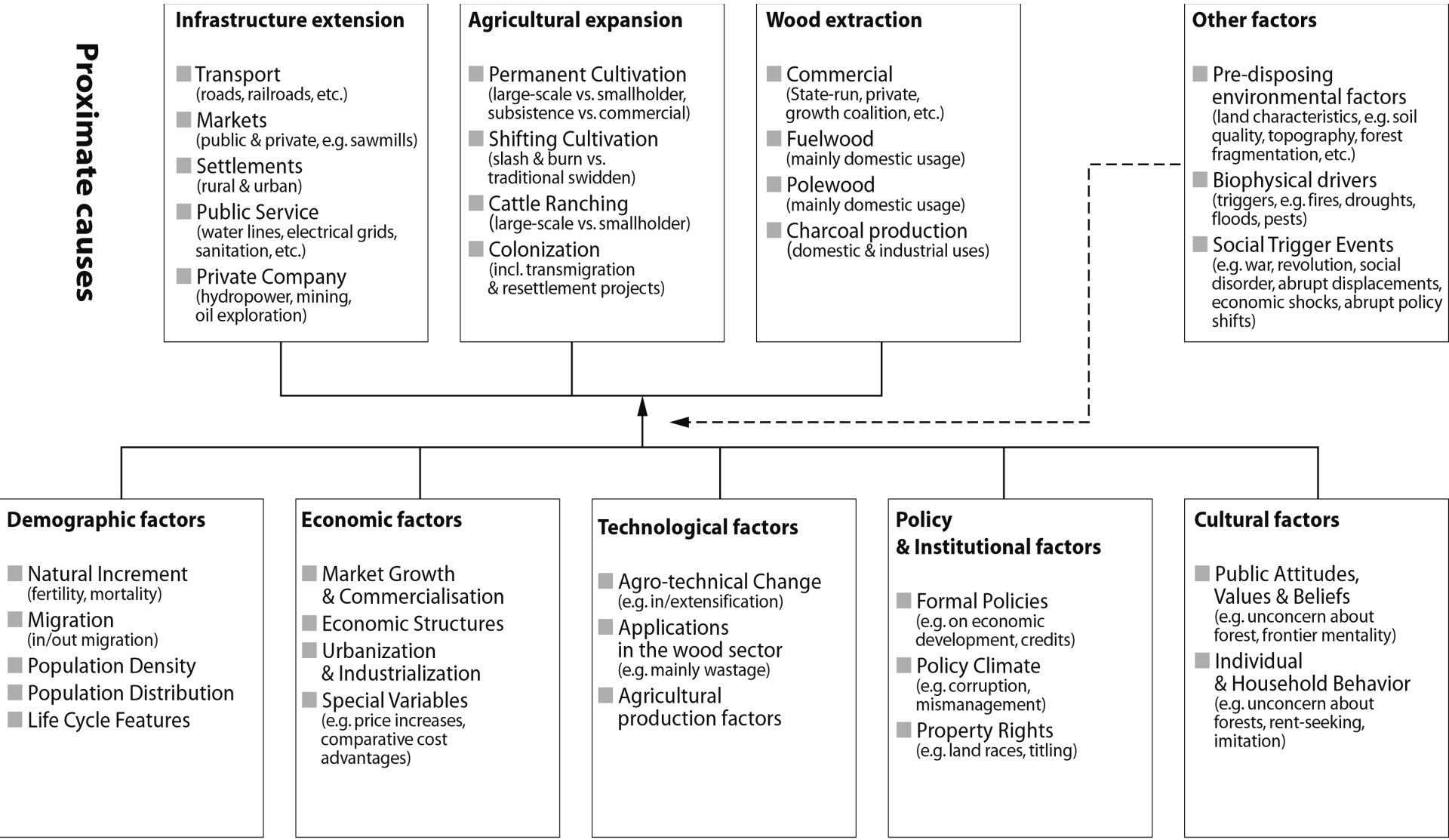
Labor and Investment



Urban – Region Interactions


Loss of Tropical Rain Forest and Woodland
Percent (of 1700 value)
35
30
25
20
15
10
5
0
1750
1800
1850
1900
1950
2000
Year
Richards (1991), WRI (1990)

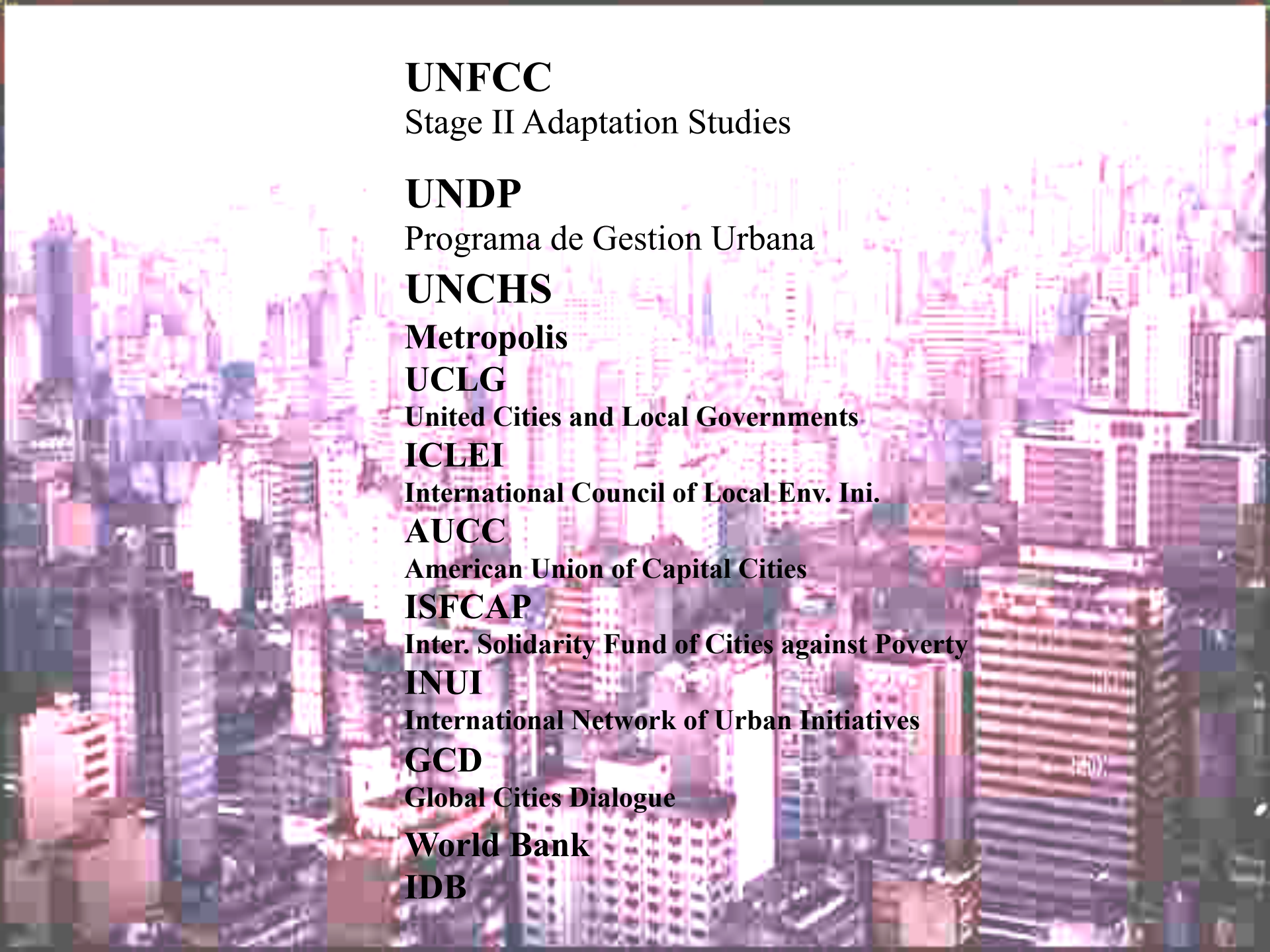
Drivers of Tropical Deforestation



Source: Geist and Lambin 2001

Land use changes induced in Tabasco by fast urban growth in Mexico City 1960s-1970s

Rapid deforestation of large areas of rain forest in Tabasco for grasslands and cattle growing to supply the demand of in Mexico City



UNFCC
Stage II Adaptation Studies

UNDP
Programa de Gestion Urbana

UNCHS

Metropolis

UCLG
United Cities and Local Governments

ICLEI
International Council of Local Env. Ini.

AUCC
American Union of Capital Cities

ISFCAP
Inter. Solidarity Fund of Cities against Poverty

INUI
International Network of Urban Initiatives

GCD
Global Cities Dialogue

World Bank

IDB

UN HABITAT

•Global Network of Capacity Building

- Strategies and innovative experiences for policy and decision making
- Guidance for national and local decision makers
- Operate through government agencies, local authorities, civil organizations, profesional organizations, and academic institutions

•Agenda 21

•State of the World's Cities Report

•Urban Indicators Program

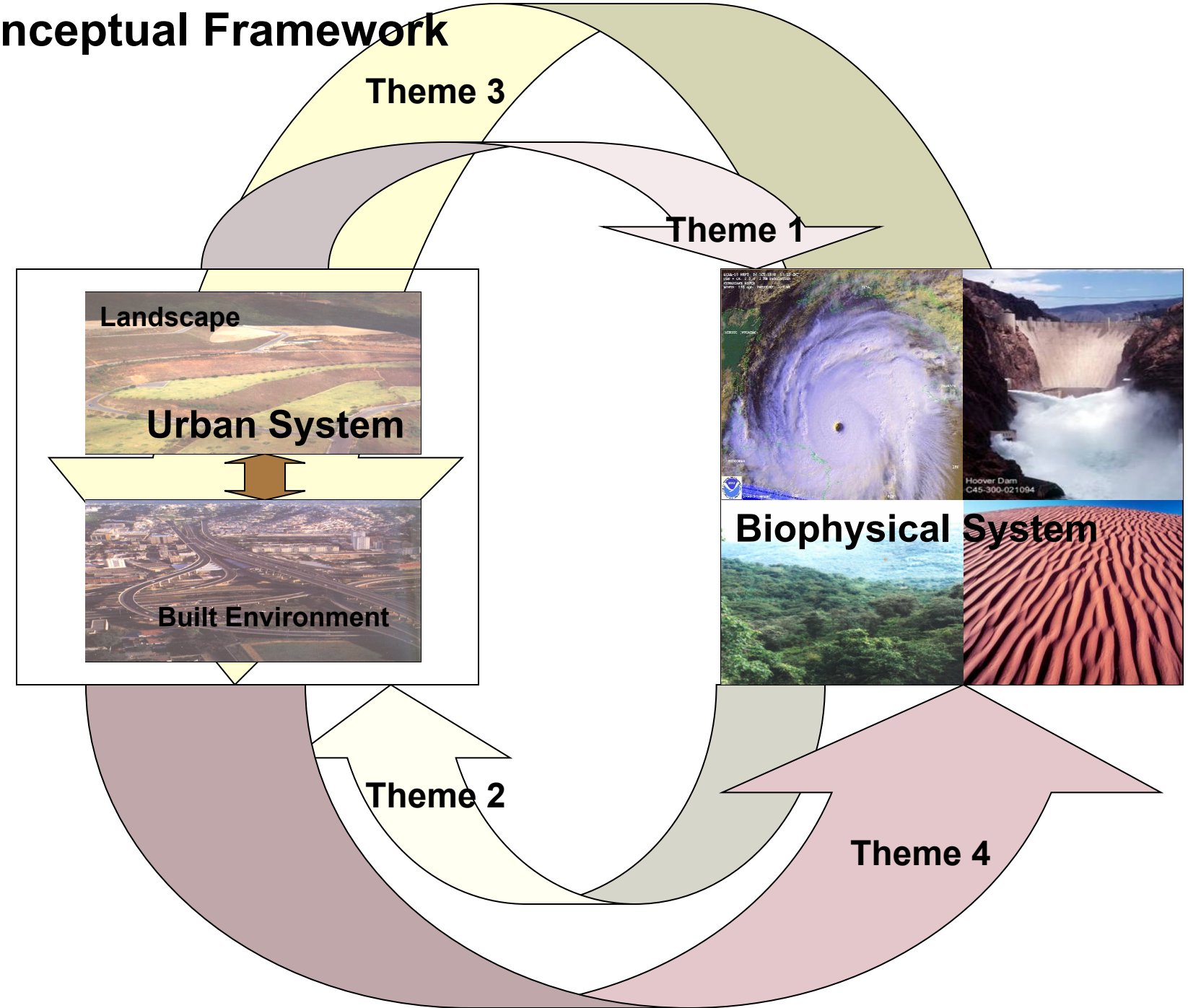
•Global Urban Observatory

•The Best Practices and Leadership Program

•Global Trends in Sustainable Development

•ICLEI

Conceptual Framework



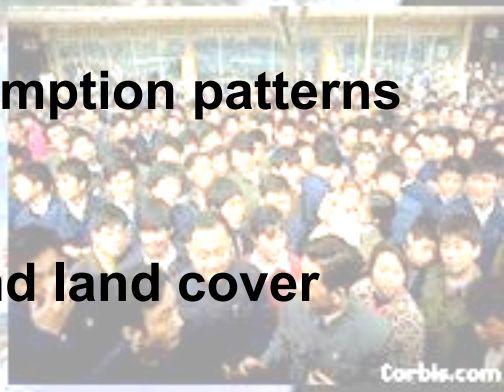
Theme 1. Urban Processes that Contribute to Global Environmental Change

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

Research Question 1.1. How do lifestyles and consumption patterns within areas contribute to GEC?

Research Question 1.2. How does urban land use and land cover change affect GEC?

Research Question 1.3. What are the zones of influence of urban systems, and how do these social and biophysical 'teleconnections' affect GEC?



Theme 2. Pathways though which Global Environmental Change Affects the Urban System

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

Research Question 2.2. How do global environmental change Contribute to shaping the built environment?

Research Question 2.3. How do GECs affect the resource base upon which urban systems rely?

Theme 3. Interactions and Responses within the Urban System

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.

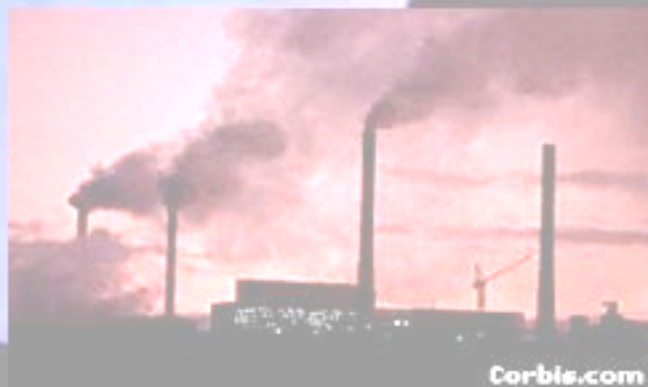
Research Question 3.1. How do these interactions between the human and the physical systems shape the impact of global environmental change?

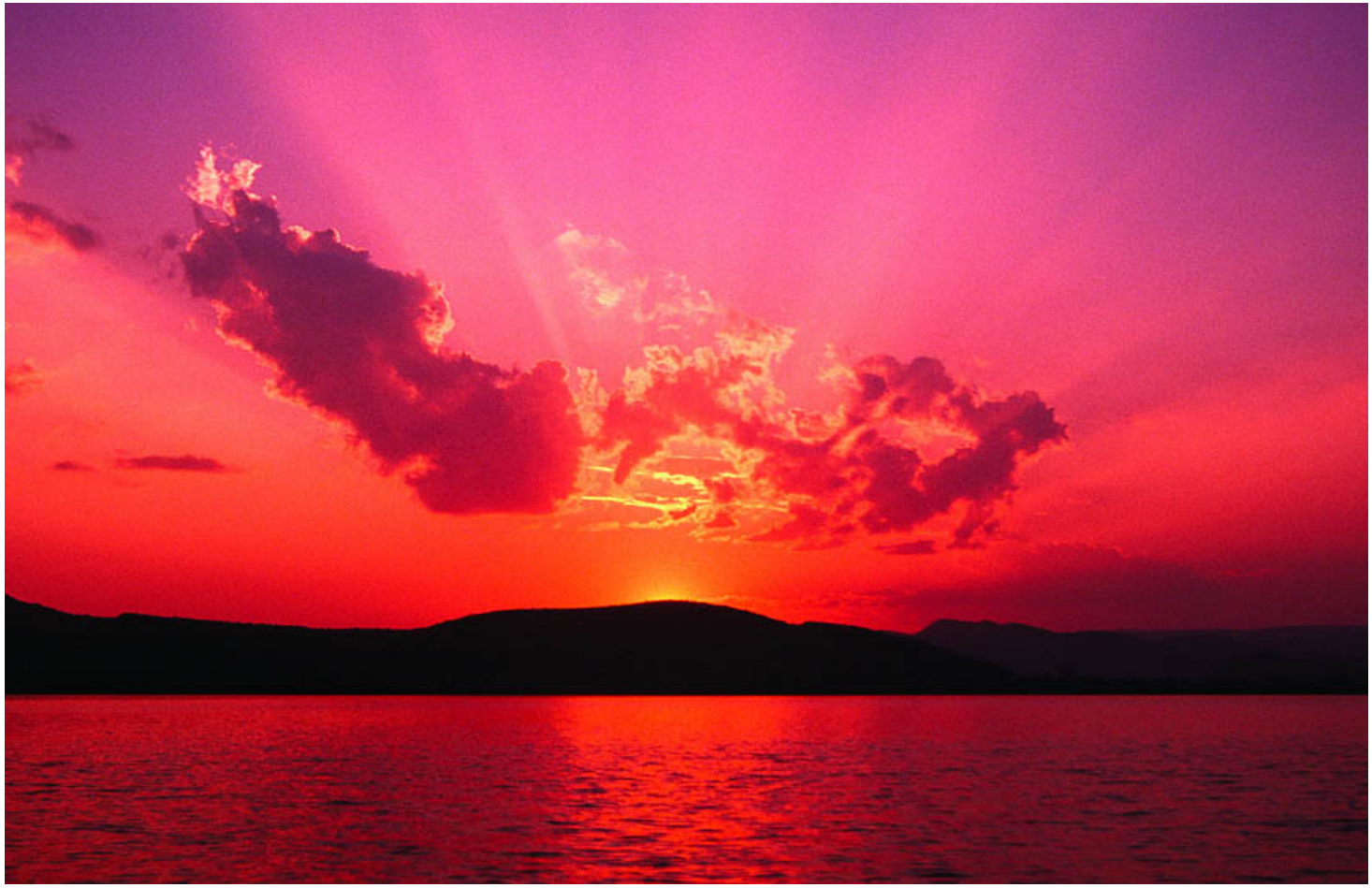
Research Question 3.2. How do the interactions between the human and physical systems shape the responses to global environmental change?

Research Question 3.3. How do the impacts of global environmental change affect livelihoods in urban communities?

Theme 4. Consequences of Interactions within Urban Systems on GEC

Research Question 4.1. How do the result of interactions within the urban system modify the impacts on various components of global environmental change?





“The power and majesty of nature in all its aspects is lost on him who contemplates it merely in the detail of its parts, and not as a whole” (Pliny 1977; 581).