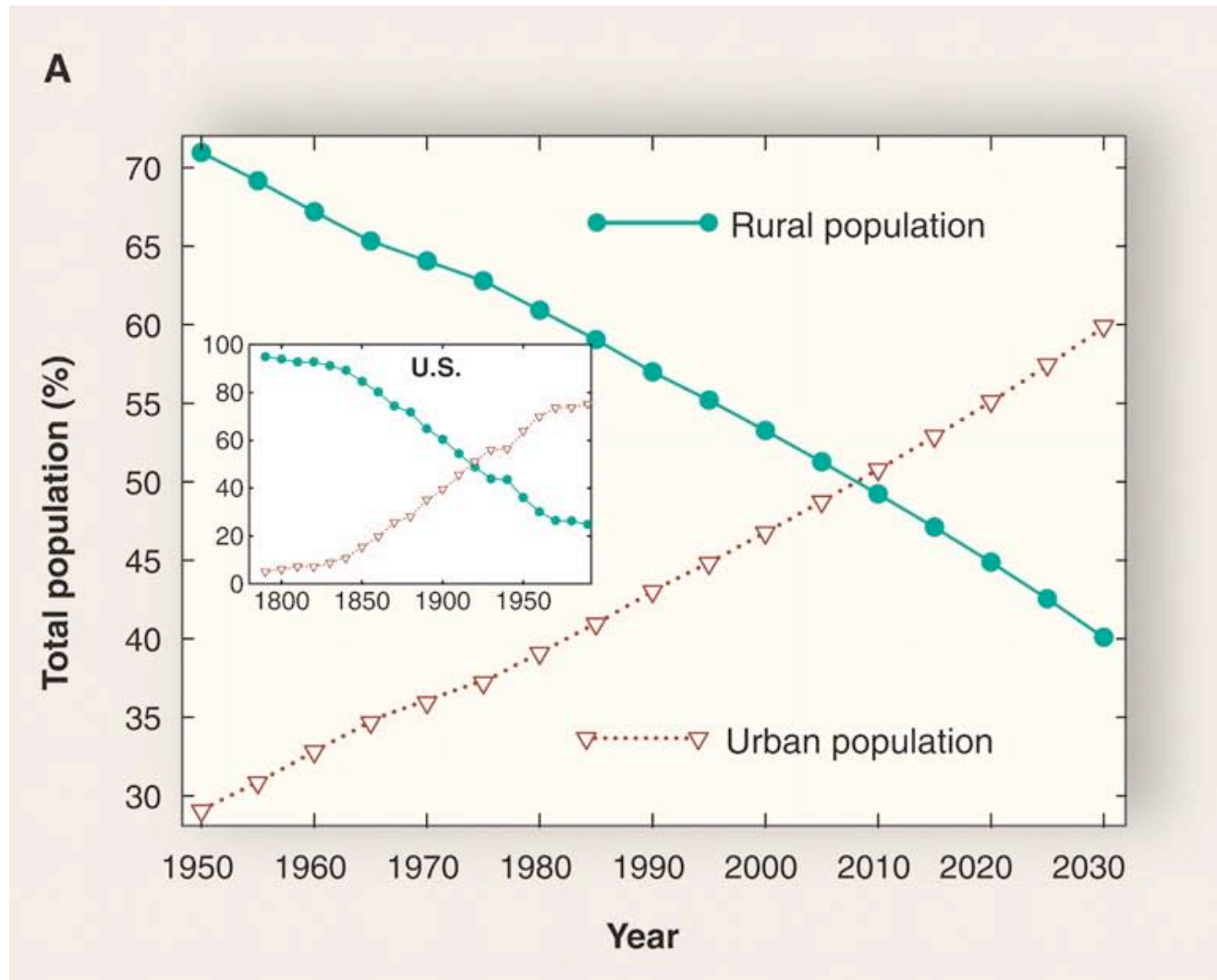


# Cities and Climate Change

Xuemei Bai

CSIRO Sustainable Ecosystems

Fig. 1. (A) Change in world urban and rural population (%) from 1950 to 2030 (projected)



N. B. Grimm et al., Science 319, 756 -760 (2008)



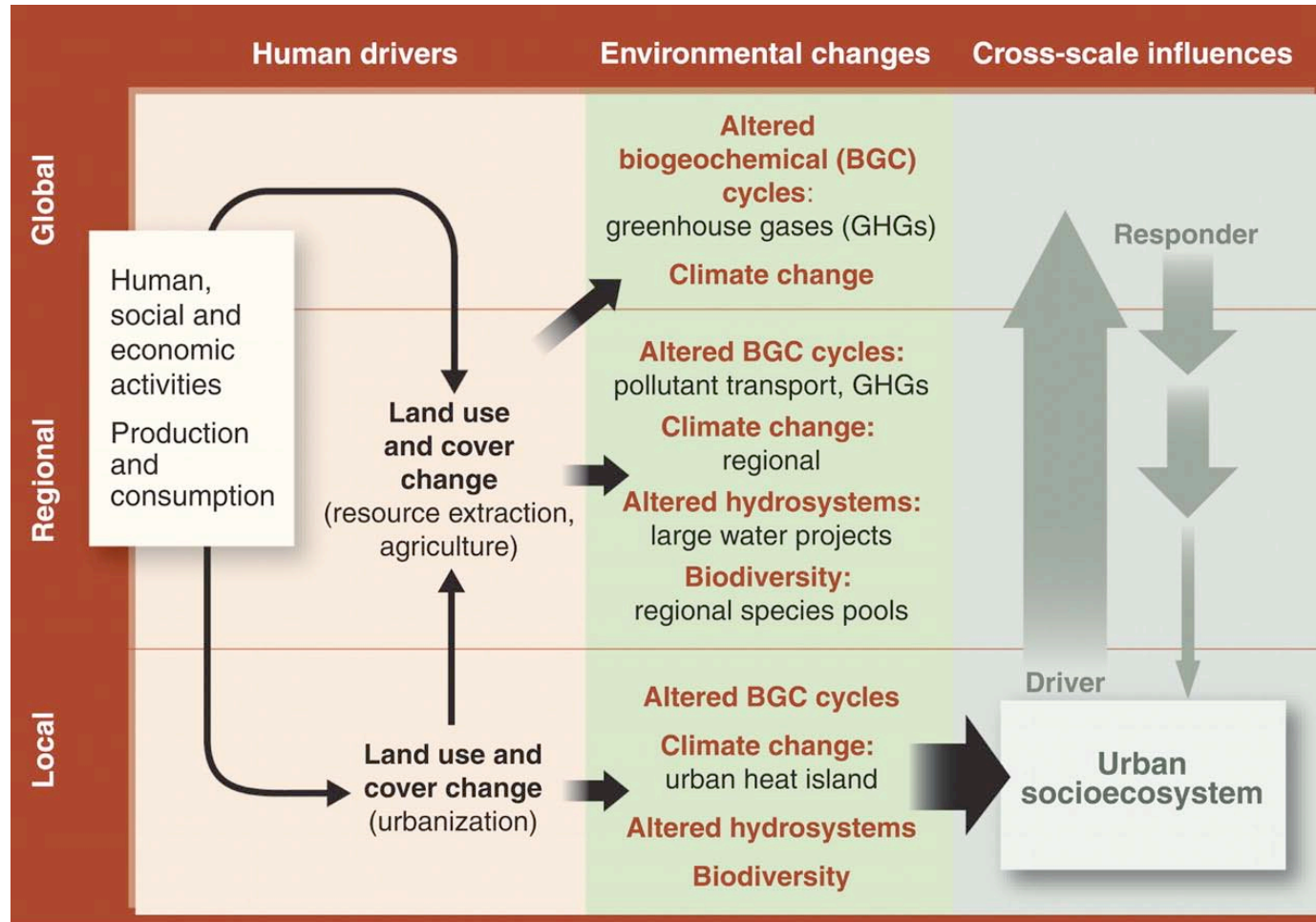


# Global Impacts of Cities

- Although urban population growth over the past century occurred on less than 3% of the Earth's surface, the impact has been global, with 78% of carbon emissions, 60% of residential water use, and 76% of wood used for industrial purposes attributed to cities.

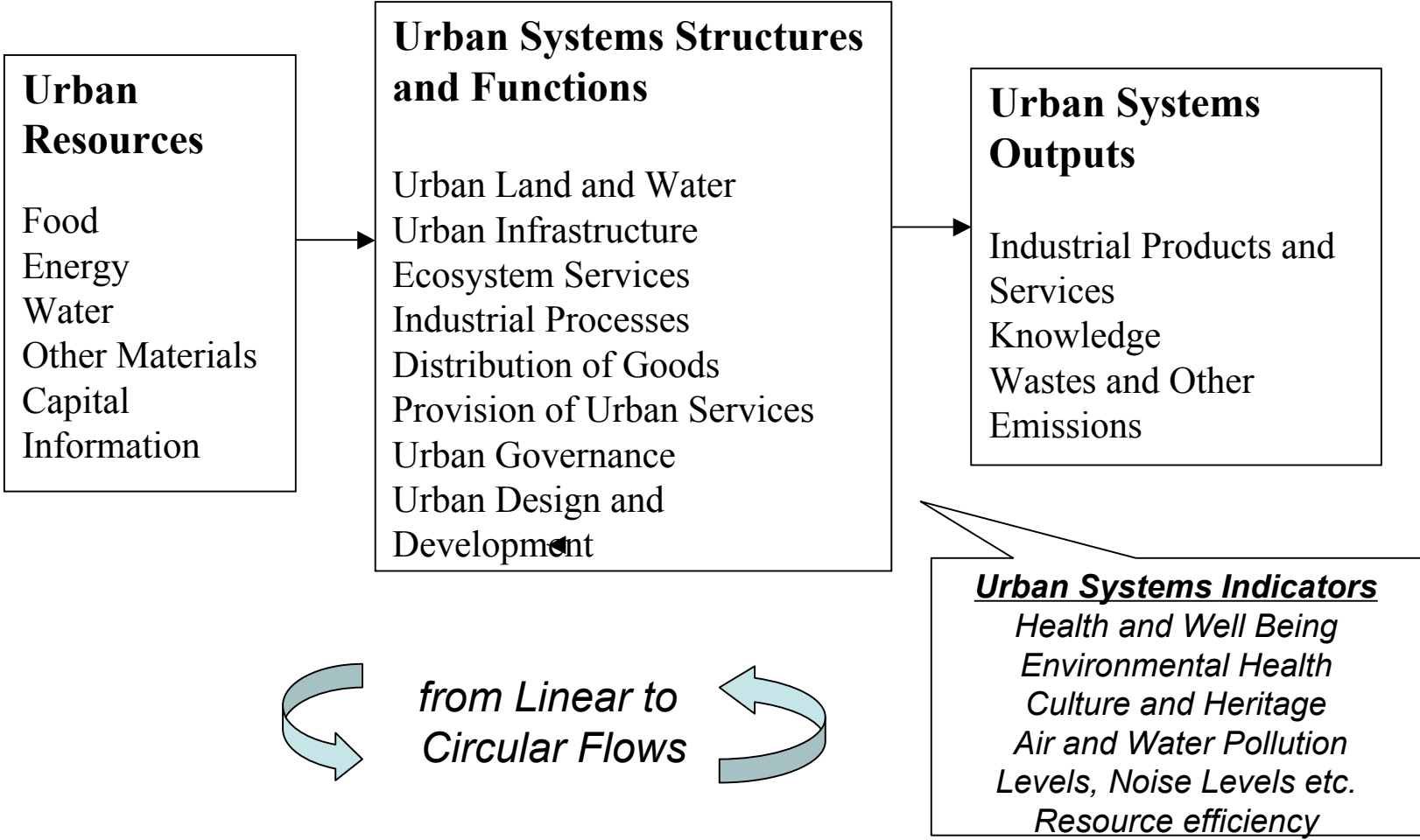
(Grimm et al, *Science*, 2008)

**Fig. 2. Framework showing urban socioecosystem (lower right) as a driver of (upward arrows) and responder to (downward and horizontal arrows) environmental change**

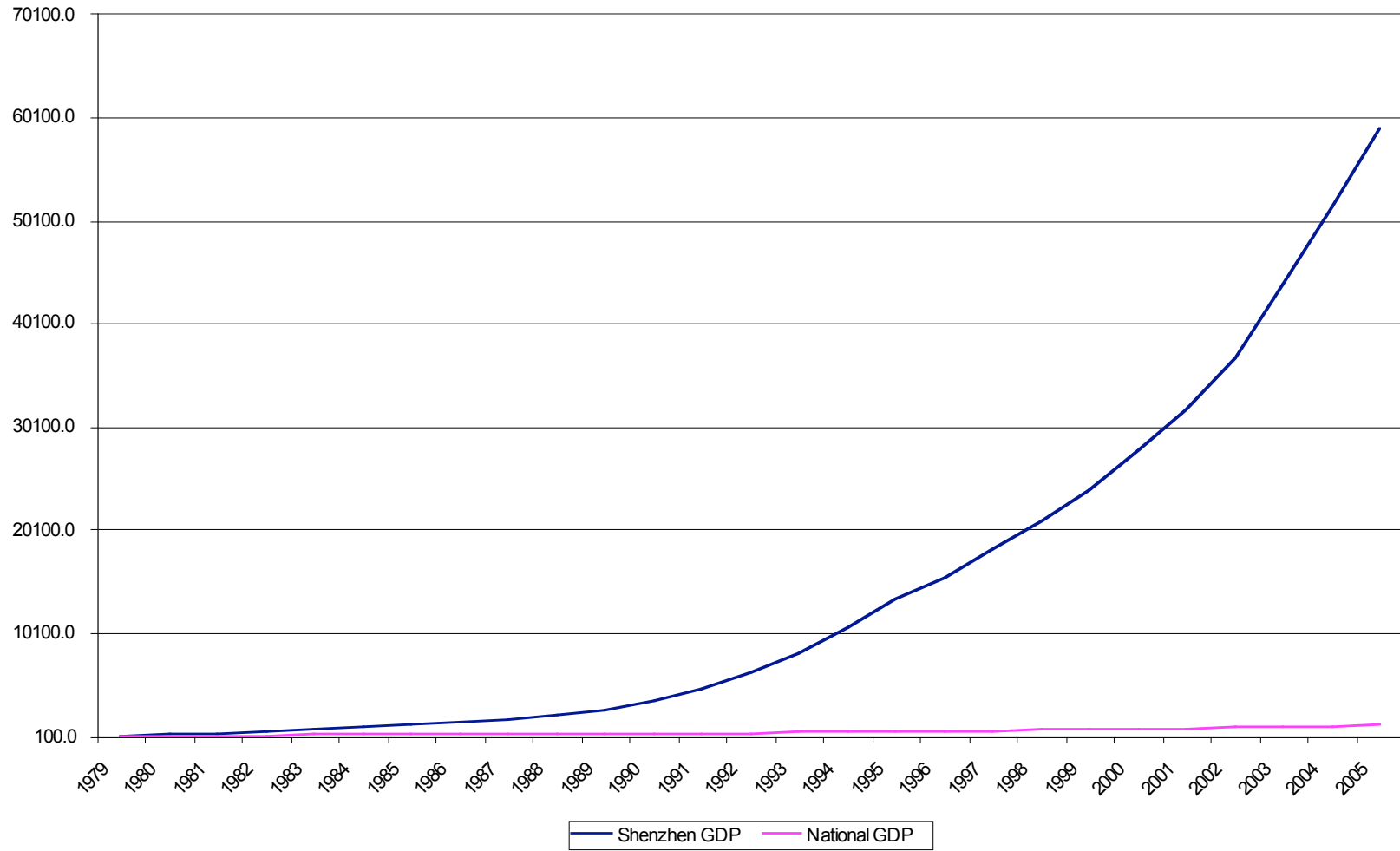


**N. B. Grimm et al., Science 319, 756 -760 (2008)**

# Urban Metabolism

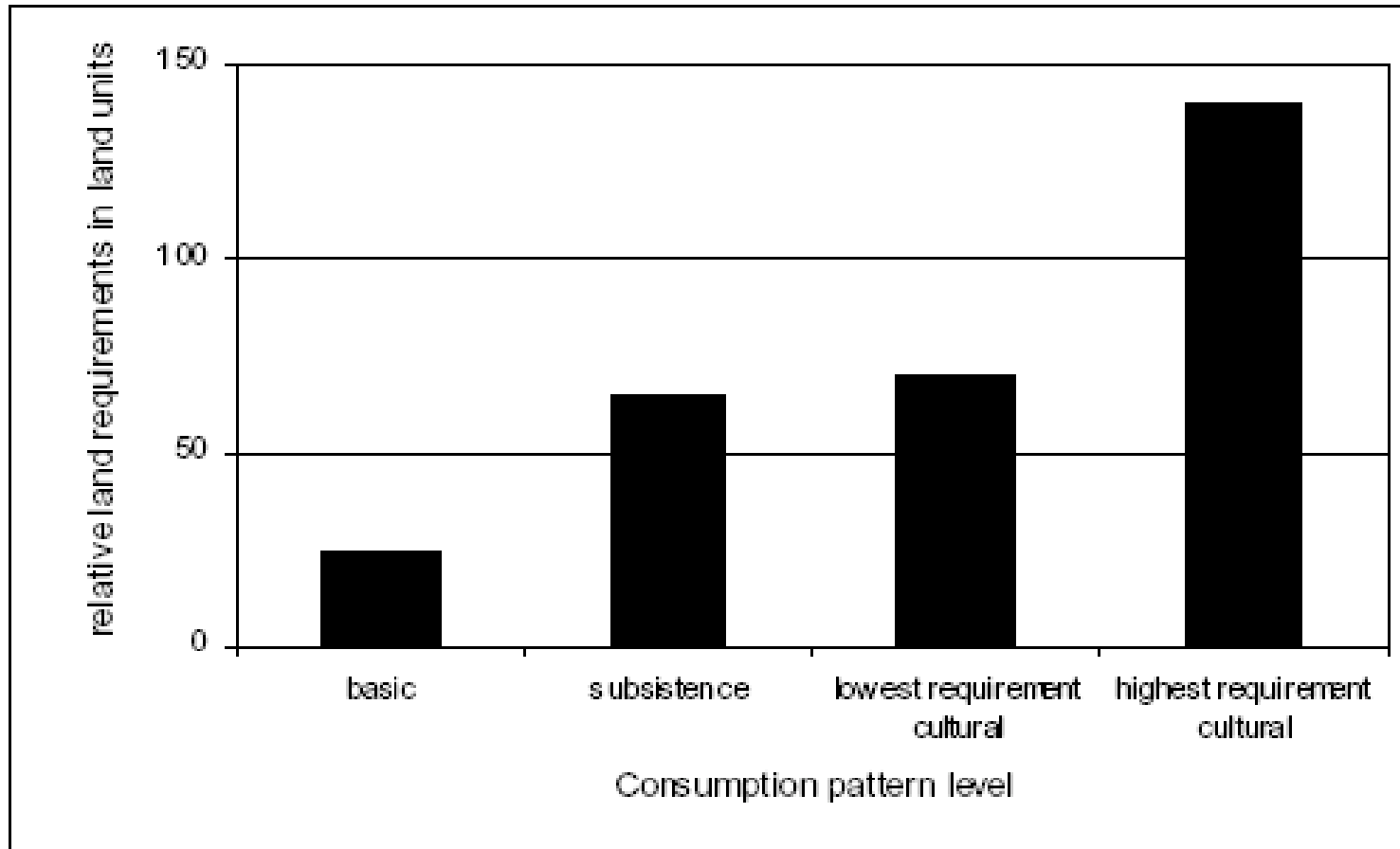


# Economic Activities



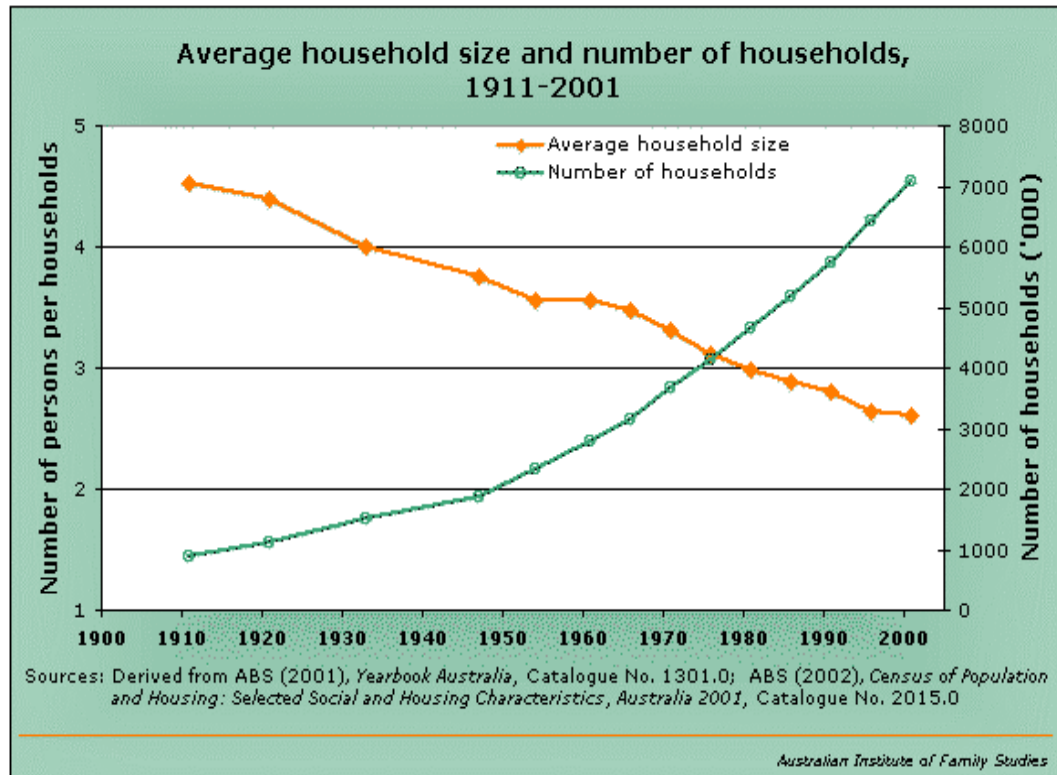
Total GDP Growth Trend: Shenzhen vs. China  
(1979 as 100)

**Fig. S2. Relative land requirements for the basic and subsistence level, and actual relative land requirements for the cultural level. The latter requirements are based on existing food consumption patterns. (Adapted from Gerbens-Leenes and Nonhebel 2002)**



**N. B. Grimm et al., Science 319, 756 -760 (2008)**

# Social and Cultural Dimension



## Some reasons:

Aging population

More people living alone

Couples delaying children

Fewer children per family

Rising/divorce separation

More households and fewer people...

# The Challenges

- Scale Argument:
  - a) Spatial Scale: *“Not on My Turf”*
  - b) Temporal Scale: *“Not in My Term”*
  - c) Institutional Scale: *“Not My Business”*

**Figure 1** Spatial range of impact of different urban environmental issues. Poverty-related issues tend to have local impacts, production-related issues tend to have local to regional impacts, and consumption-related issues tend to have regional to global impacts.

*(Source: Bai, 2001)*

Temporal scale of a mayor's decision making.

(a) Temporal scale of planning

(Source: Bai XM, 2007)

Temporal scale of a mayor's decision making.  
b) Temporal scale of environmental impacts of decisions  
(Source: Bai XM, 2007)

# The “Boundary Effect- Management Pitfall”

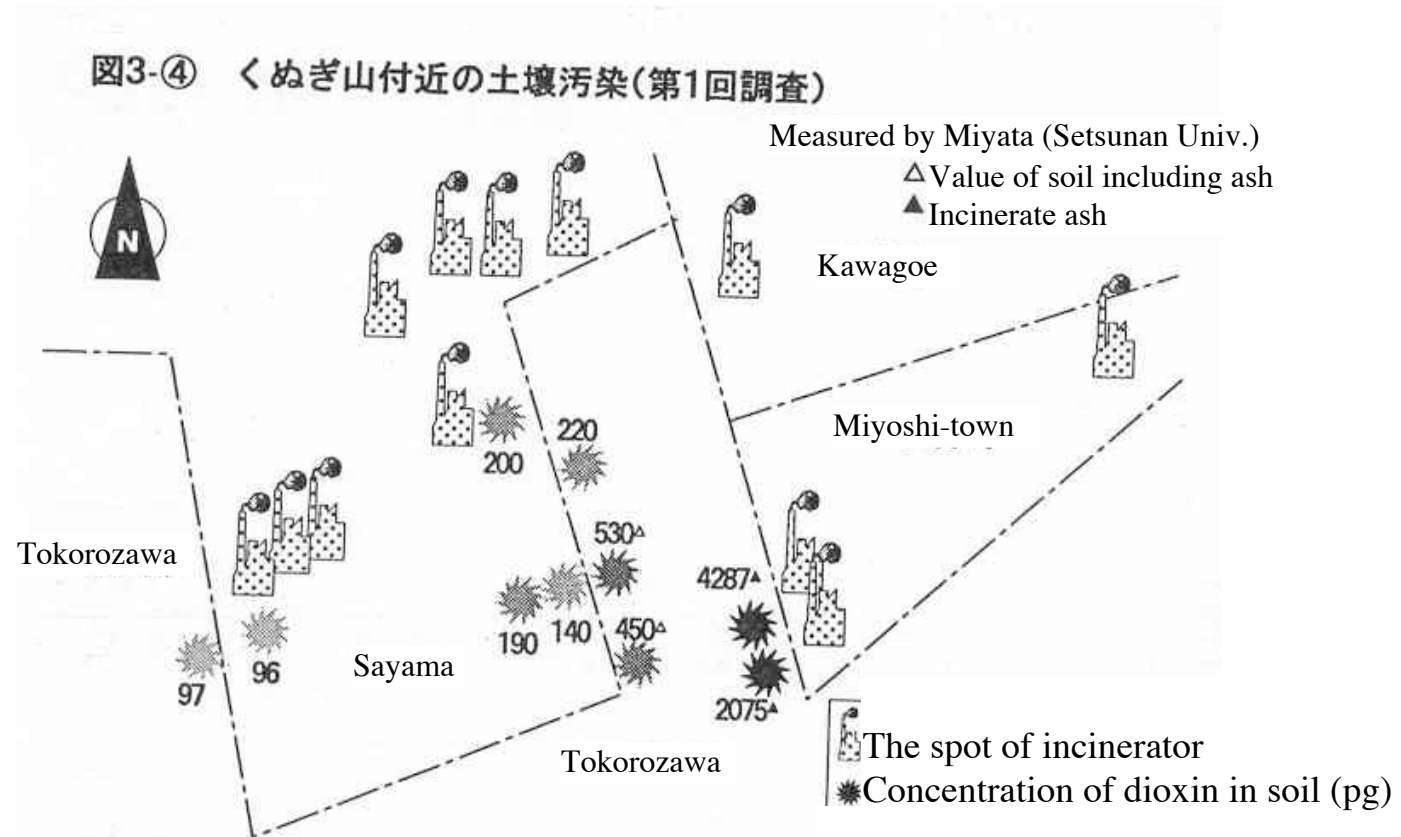
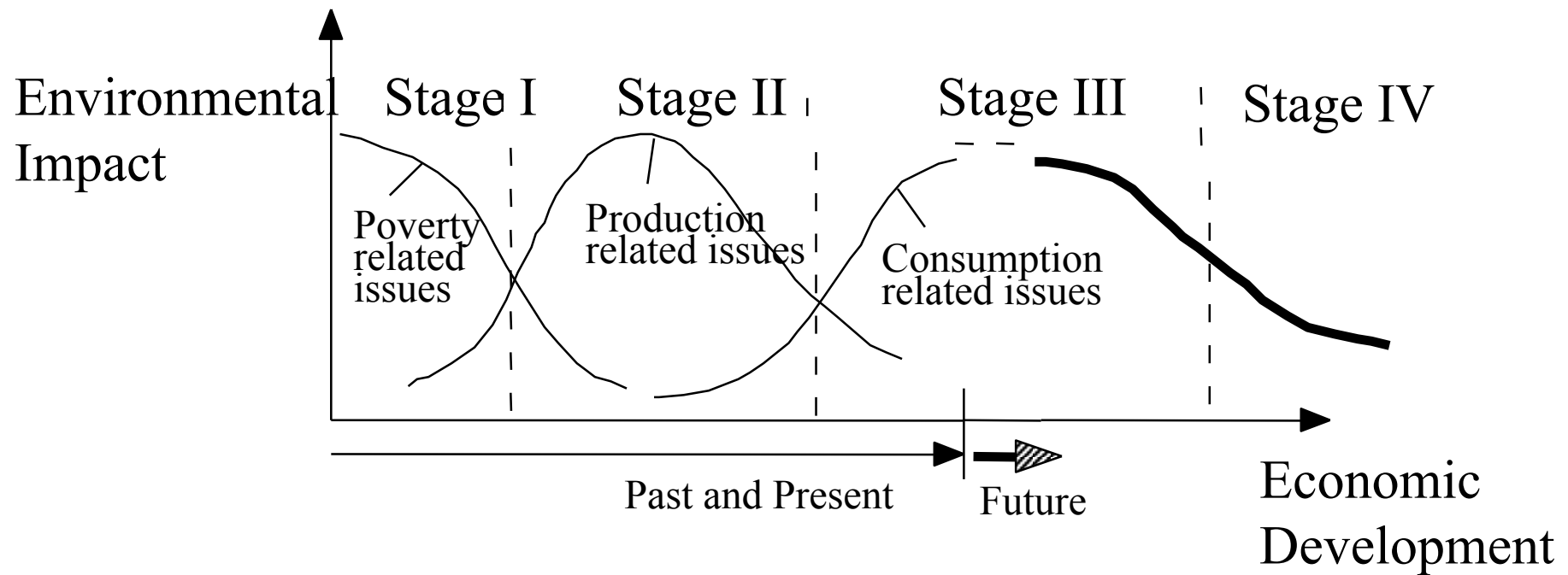


Fig. 3-4 Soil contamination around Kunugi Mountain (the first investigation)

# The Challenge II

- Readiness Argument: A *unique* challenge for developing cities
  - Most pressing issues predominantly “local”
  - Human and financial capacity not sufficient
- Typical reaction along this line: Why bother the global issue when people are dying from local environmental issues such as bad sanitation and pollution?

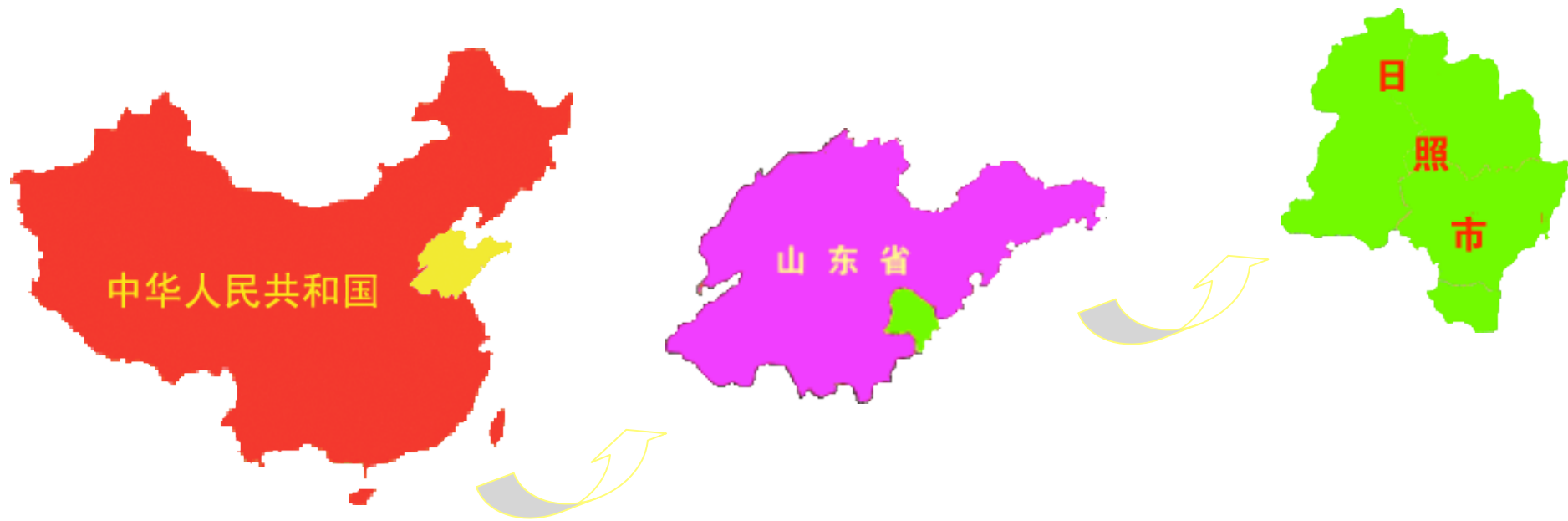


**Fig. 5**-Conceptual illustration of a typical evolutionary trajectory of environmental problems in developed country cities, and an optimistic future projection in relation to economic development  
 (Source: Bai and Imura, 2000)

# Opportunities

- **Inter-linkages** between global and local issues
  - Not a zero sum game
    - Beijing air pollution control could result in a 10.5 million tons of CO<sub>2</sub> reduction by 2030 (Tsinghua univ. 2000)
  - Unique opportunity to obtain financial aid to tackle local issues
- **Economic benefits**
  - In 2004, the 147 US member cities of CCP collectively reduced GHG emissions by 23 million tons through efficiency measures, with a cost savings of over \$600 million (ICLEI 2005)
  - *“Doing it earlier is cheaper”*
  - Rizhao City case: Using solar energy

# Rizhao- Solar Powered City in China





Solar energy use in Rizhao, China

# Cost Benefit Analysis

	<u>Solar Water Heater</u>	<u>Electric Water Heater</u>
<b>Installment:</b>	<b>1500RMB (US\$190)</b>	<b>1500 RMB (US\$190)</b>
<b>Operating cost:</b>	<b>None</b>	<b>730RMB/Yr</b>
<b>Lifespan:</b>	<b>15 years</b>	<b>5 years</b>
<b>Total Costs in 15 years:</b>	<b>1,500 RMB</b>	<b>15,500 RMB</b>
<b>Net Savings In 15 years:</b>	<b>14,000 RMB</b>	

## Dong Tan- World First Eco-city?

- Chongming Island, offshore of Shanghai
- Zero emission, eco-city plan

**For the birds. Dongtan aims to protect an adjacent waterfowl refuge**  
**CREDIT: D. Normile / SCIENCE**



**Dennis Normile, Science 319, 740 -743 (2008)**

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