Rethinking Urbanization in the 21st Century

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SESYNC
April 13, 2016

YALE UNIVERSITY
School of Forestry
& Environmental Studies

From now until 2050, the global urban population will increase by 1.3 million every week.

Urban areas generate 80% of global GDP.

Urban areas use ~70% of global energy.

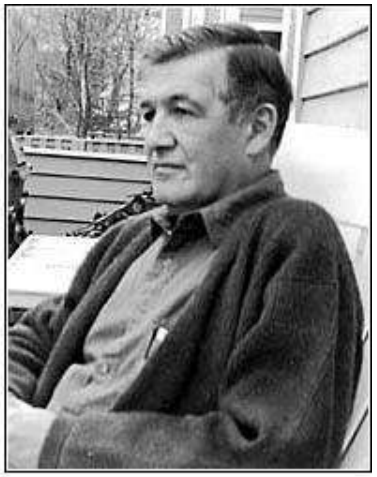
What drives urbanization?

How does urbanization the affect the environment?

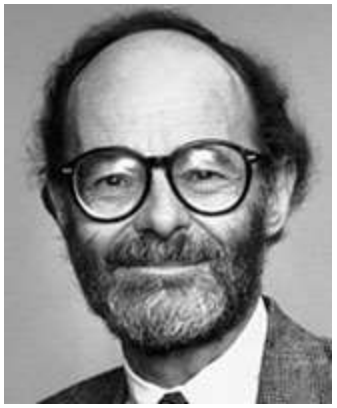
von Thünen

Burgess

Alonso



Mills



Isard

Jacobs

Mumford

Fujita

Friedmann

Hall

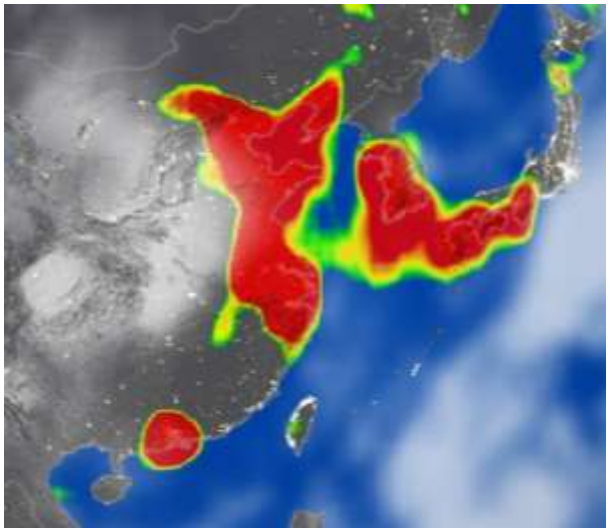
Dominant conceptualization of cities

3. Classical Athens seen from the northwest. (Watercolor by Peter Connolly)

http://www.yale.edu/yup/pdf/081979_front_1.pdf

Crisis or Opportunity for Sustainability?

Biogeochemistry

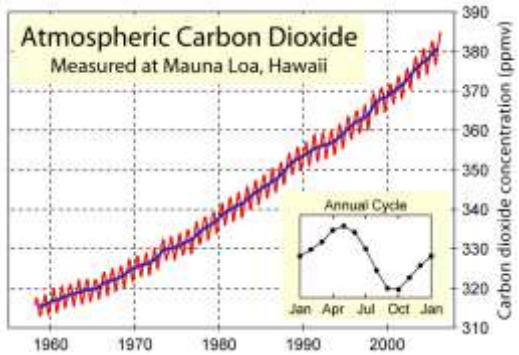


Energy demand and emissions

Urbanization
Drives
Global Change

Hydrological systems

Habitat & biodiversity



Land use

Climate change

Crisis or Opportunity for Sustainability?

Innovation

Lower per capita resource use

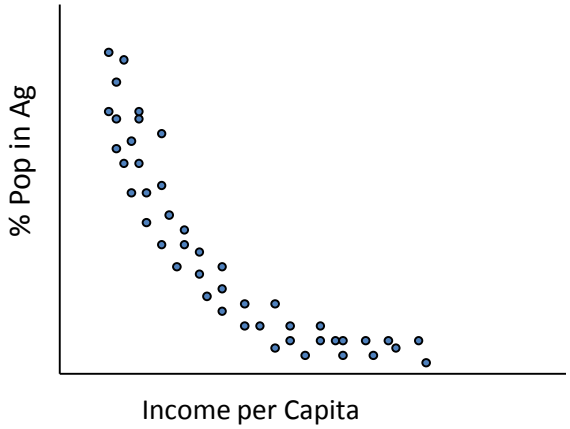
Health services, clean water, & sanitation

Urbanization Improves Human Well-Bring

Education

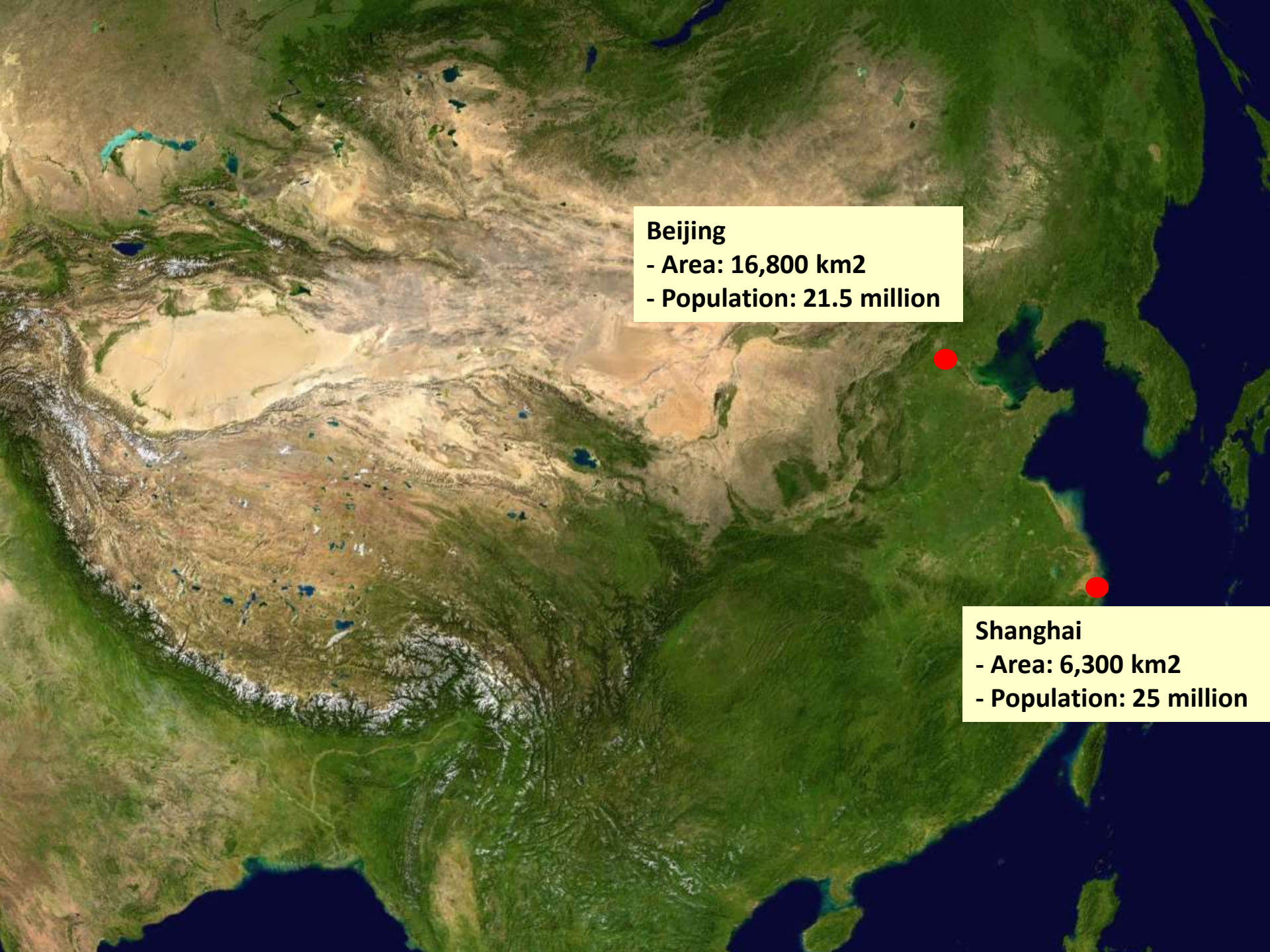
Efficient infrastructure use

Engines of economic growth



Urbanization in the 21st Century is different from the past

1. Scale
2. Rate
3. Geographic location
4. Urban form & function
5. Urban life


Beijing
- Area: 16,800 km2
- Population: 21.5 million
Shanghai
- Area: 6,300 km2
- Population: 25 million


Australia
- Area: 7.7 million km2
- Population: 23 million

Changes in Rate

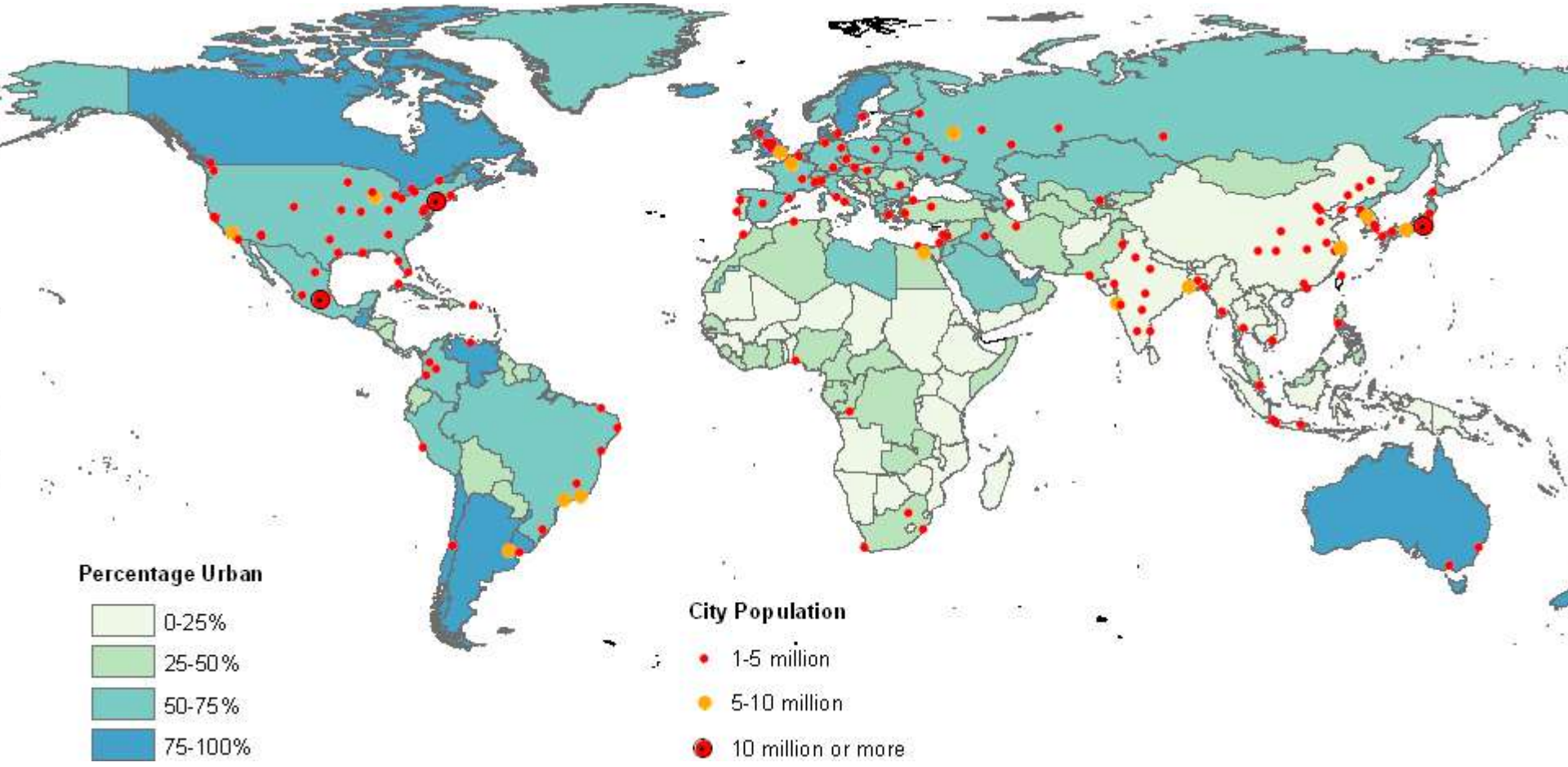
Table 2 Global urban population and time intervals for the addition of 1 billion urban residents

Year attained	Global urban population	Number of years
1960	1 billion	5000+[a]
1986	2 billion	26
2003	3 billion	17
2018	4 billion	15
2031	5 billion	13
2044	6 billion	13

(Seto et al., 2010)

Changes in Location

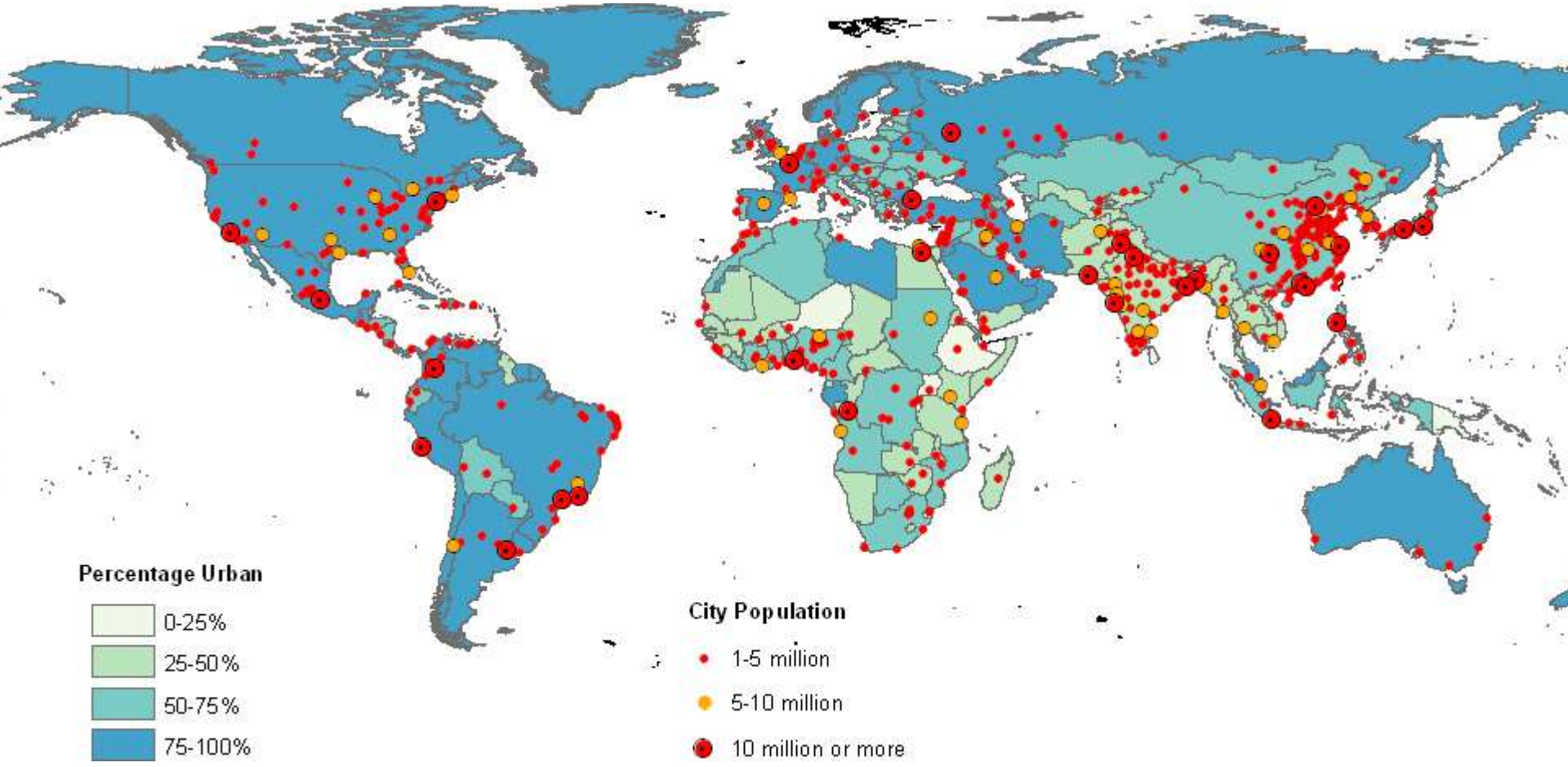
Urban Agglomerations, 1975 (proportion urban of the world: 37.2%)



World Urbanization Prospects, the 2009 Revision. New York 2010
http://esa.un.org/unpd/wup/maps_1_1975.htm

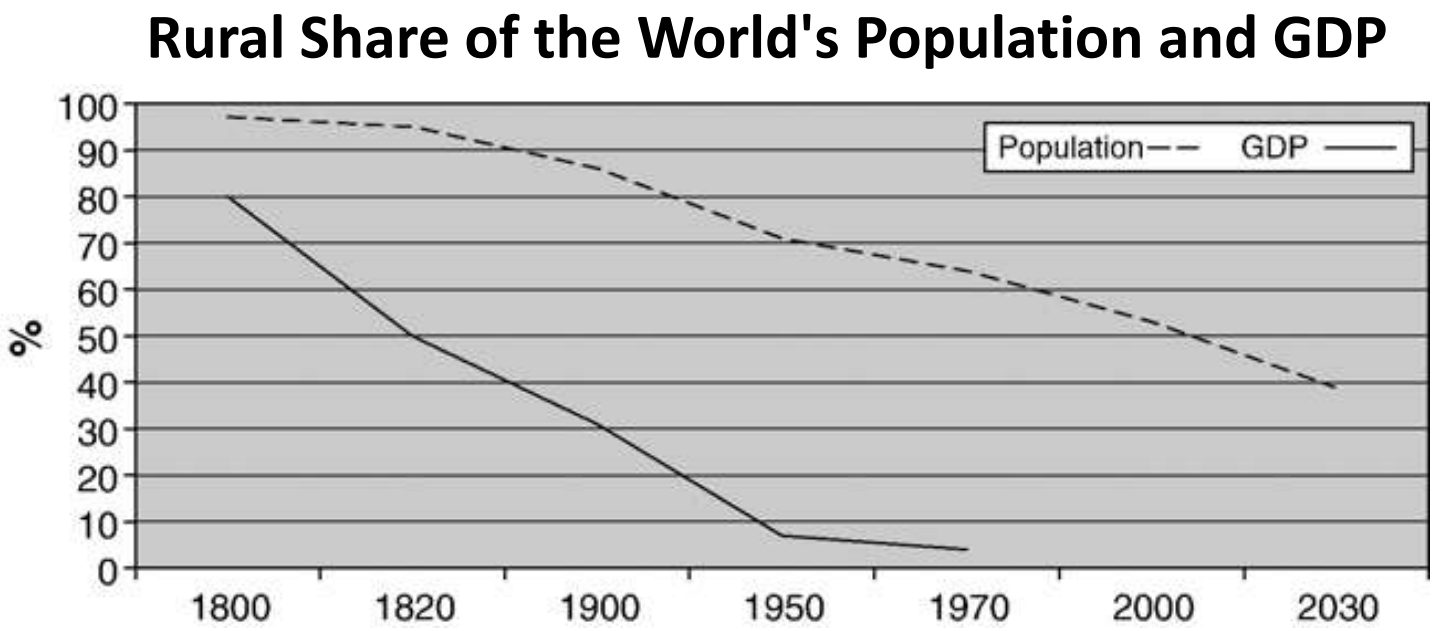
Changes in Location

Urban Agglomerations, 2025 (proportion urban of the world: 56.6%)



World Urbanization Prospects, the 2009 Revision. New York 2010
http://esa.un.org/unpd/wup/maps_1_2025.htm

Changes in Urban Function

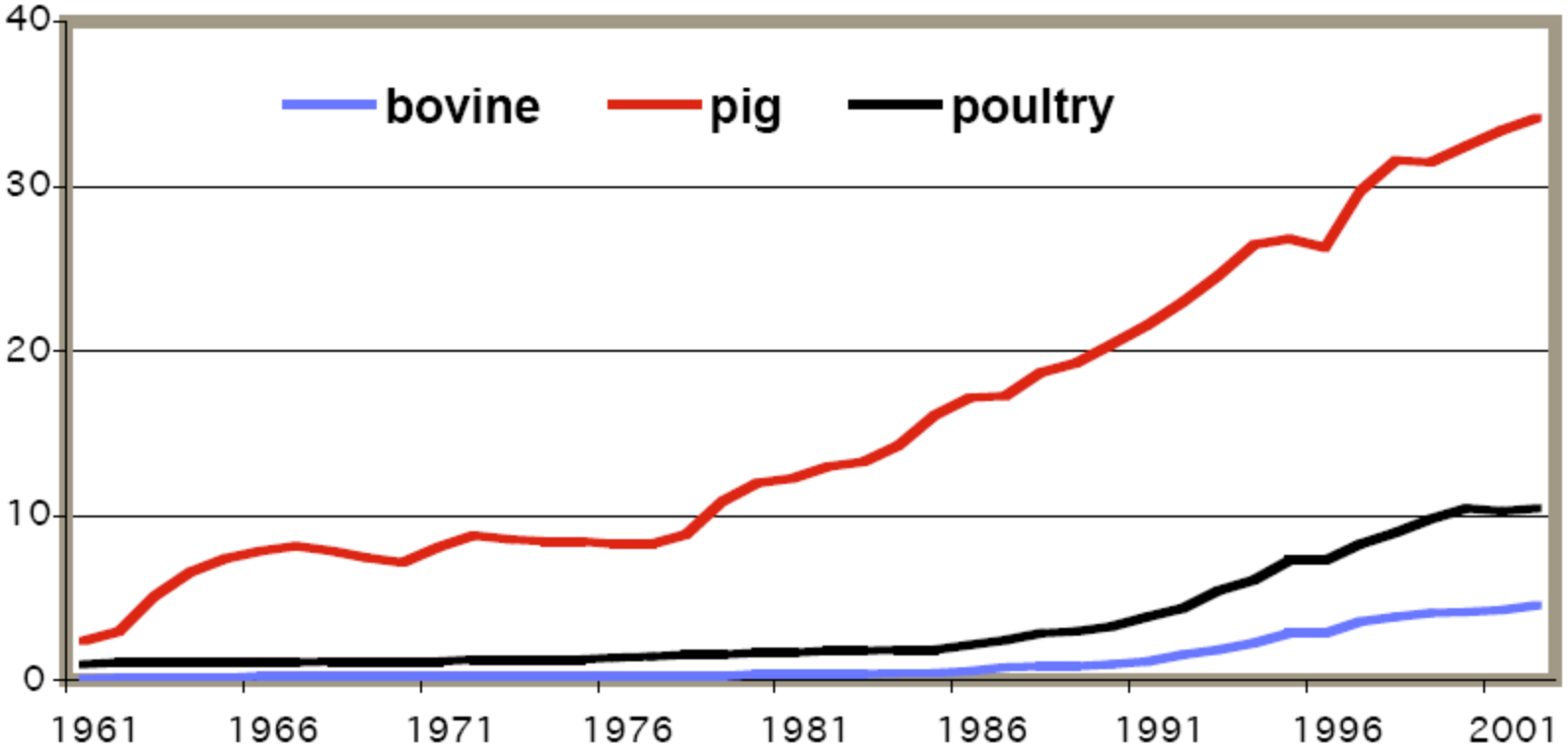


(Gutman, 2007)

Changes in Urban Life

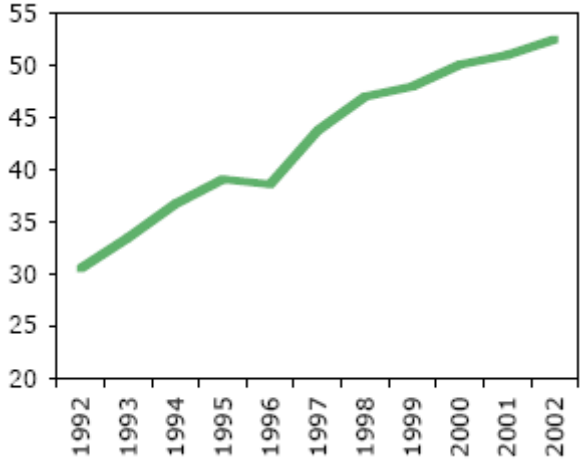
Pathways of environmental change

Consumption of Meat in China (kg/cap/yr)

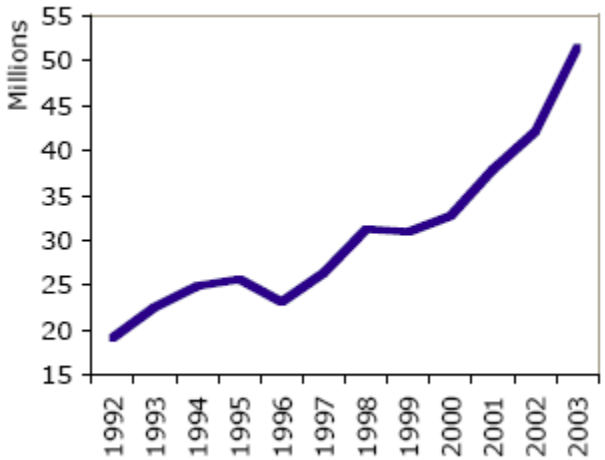


Source: *FAO*

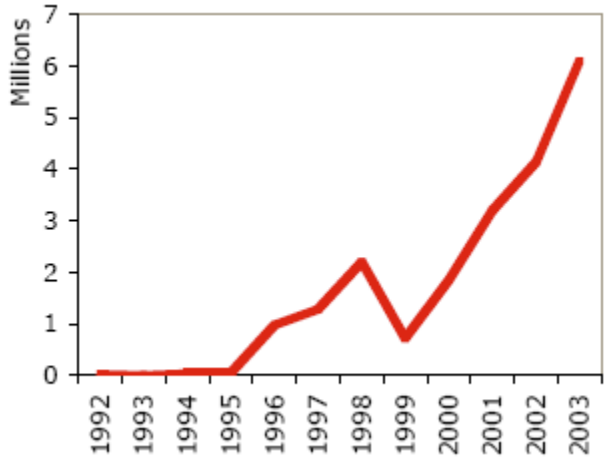
Chinese meat consumption, Brazilian soy production



Chinese per capita meat consumption (kg/cap/yr)



Brazilian soy production (million tons)



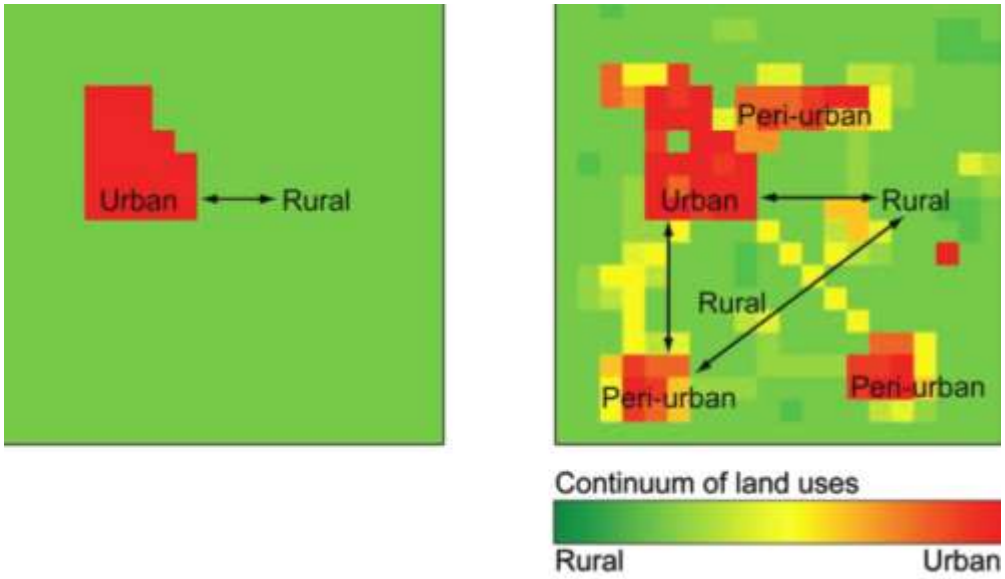
Brazilian soy exports to China (million tons)

Source: *FAO*

The Need for an Urbanization Science
Question 1

What does the Urban Century
mean for planetary sustainability?

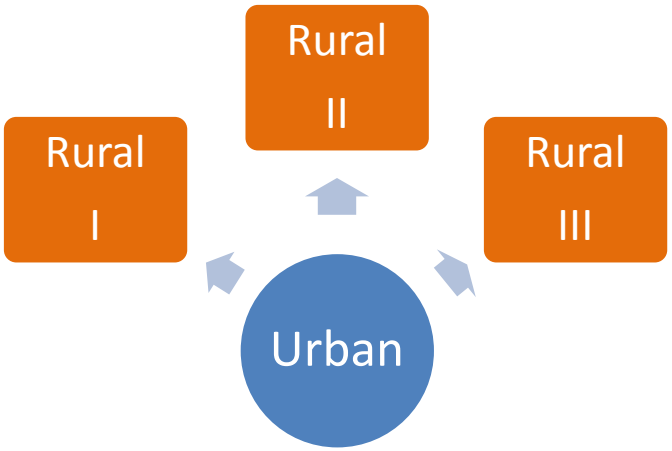
What do existing theories tell us?

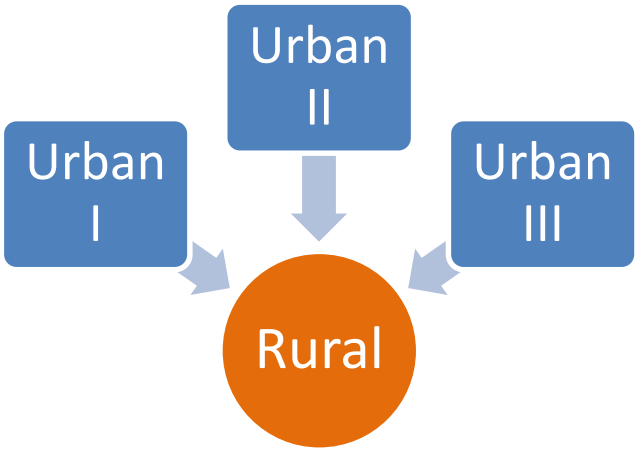


(Seto et al., 2012)

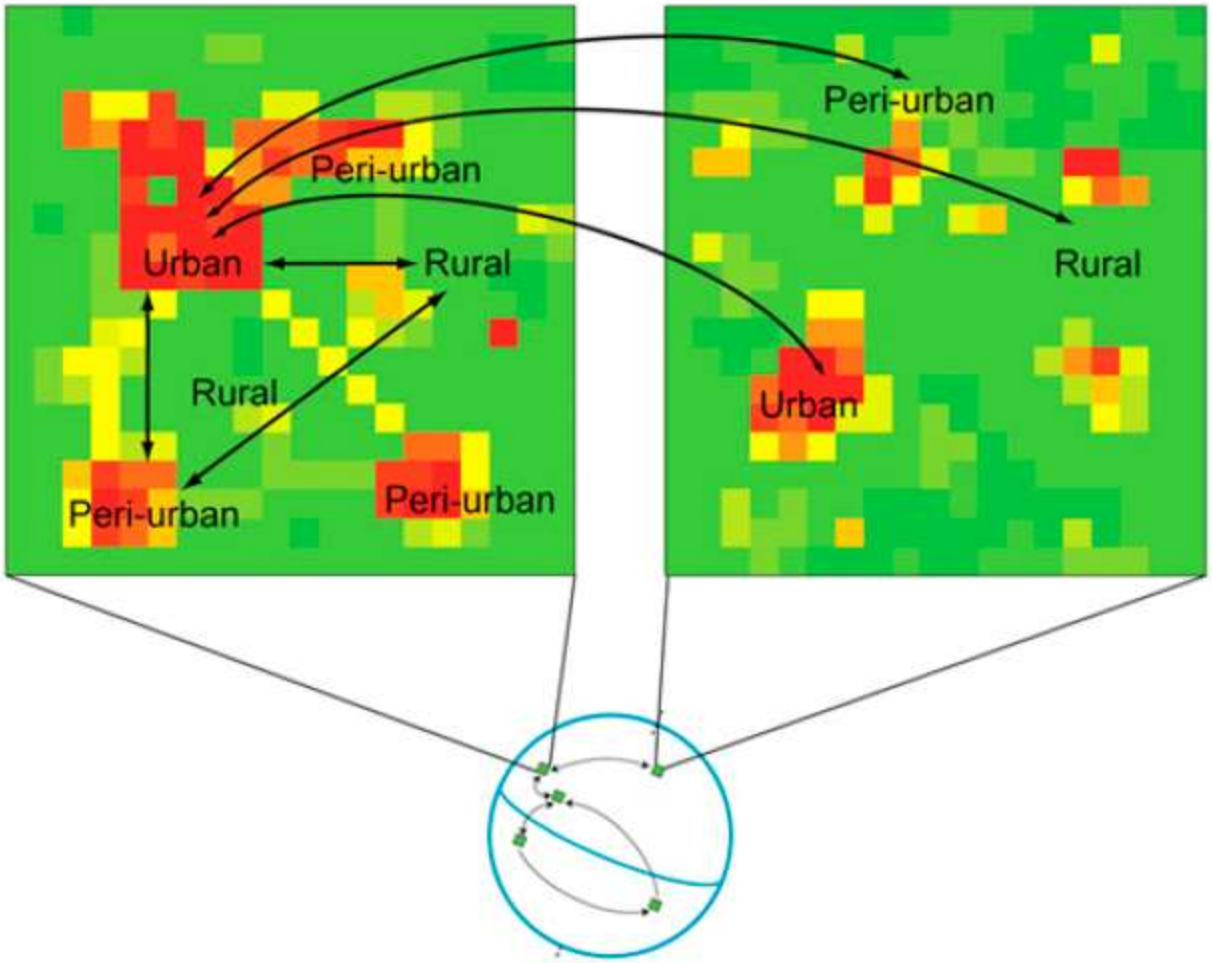
Urban Land Teleconnections

- Changes in one location underlies variation in multiple locations.



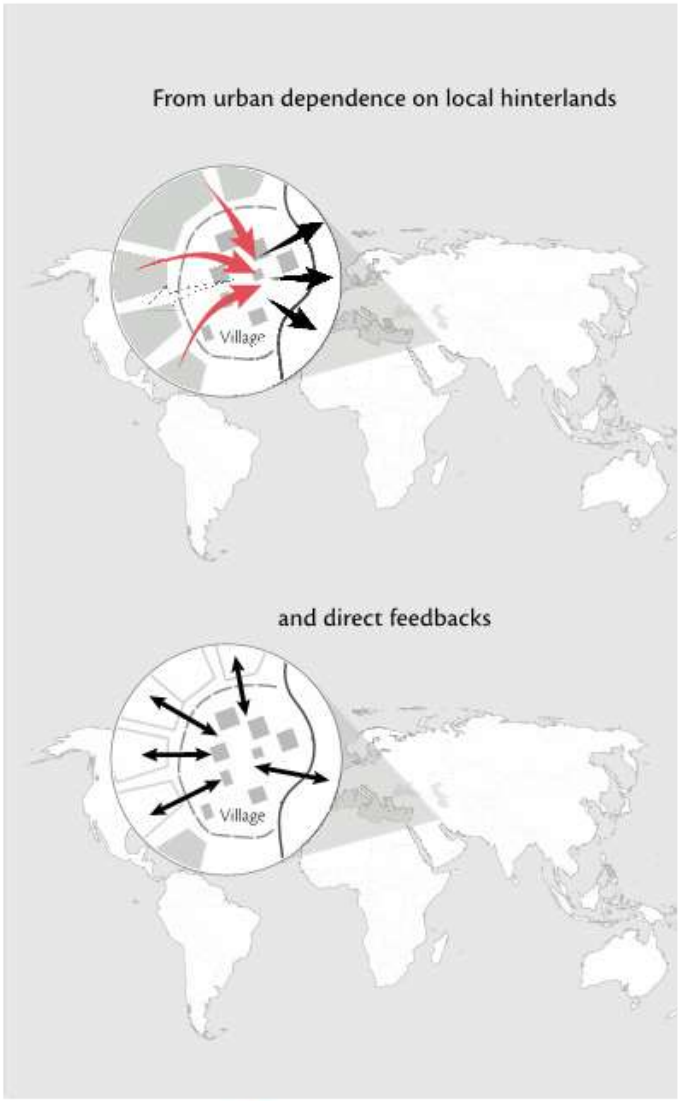


Urban Land Teleconnections



(Seto et al., 2012)

Planetary urbanization requires rethinking urban impacts and sustainability



(Elmqvist et al. 2013; Seto et al., 2012)

New Paradigms Required

- Frontier landscapes increasingly connected to urban systems.

- How to conceptualize and characterize drivers of land change across urban-rural teleconnections?

- What methods and metrics allow for full geographic and temporal accounting of the connections among land resources?

The Need for an Urbanization Science
Question 2

Are we currently in a fundamentally different era of urbanization from the past?

If yes, do existing theories still apply?

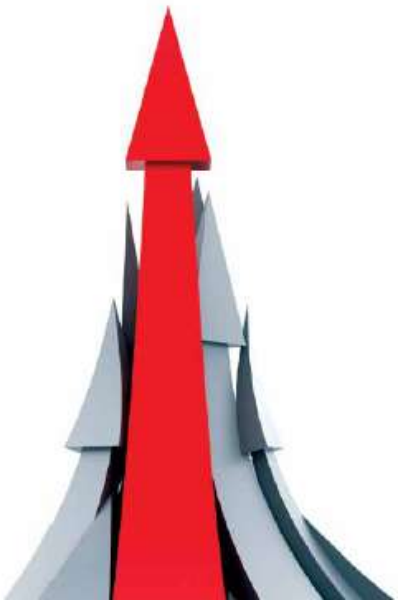
Global Real Estate Teleconnections

BENCHMARKING CHINA'S REAL ESTATE MARKET
Global Foresight Series 2010

Jones Lang LaSalle
Real value in a changing world

China's Property Market – Fast Tracking to Maturity

Benchmarking China's Real Estate Market



Colliers INTERNATIONAL

Scale and Diversity

- 1.7x nearest competitor[3]
- Thousands of clients, nearly 80% of Fortune 100
- $97.2 billion of transaction activity in 2009
- No client comprised >3% of revenues in 2009

1. Includes affiliate offices.
2. As of June 30, 2010.
3. Based on 2009 revenues versus Jones Lang LaSalle.

CBRE
CB RICHARD ELLIS

Design & Planning Teleconnections

JURONG International

AECOM

100+ Countries

45k Professionals

SOM.com
Skidmore, Owings & Merrill LLP

ARUP

We shape a better world

KOETTER | KIM & ASSOCIATES | INC.

SERVICES

Architecture

Building Services / MEP Engineering

Digital Design

Urban Design & Planning

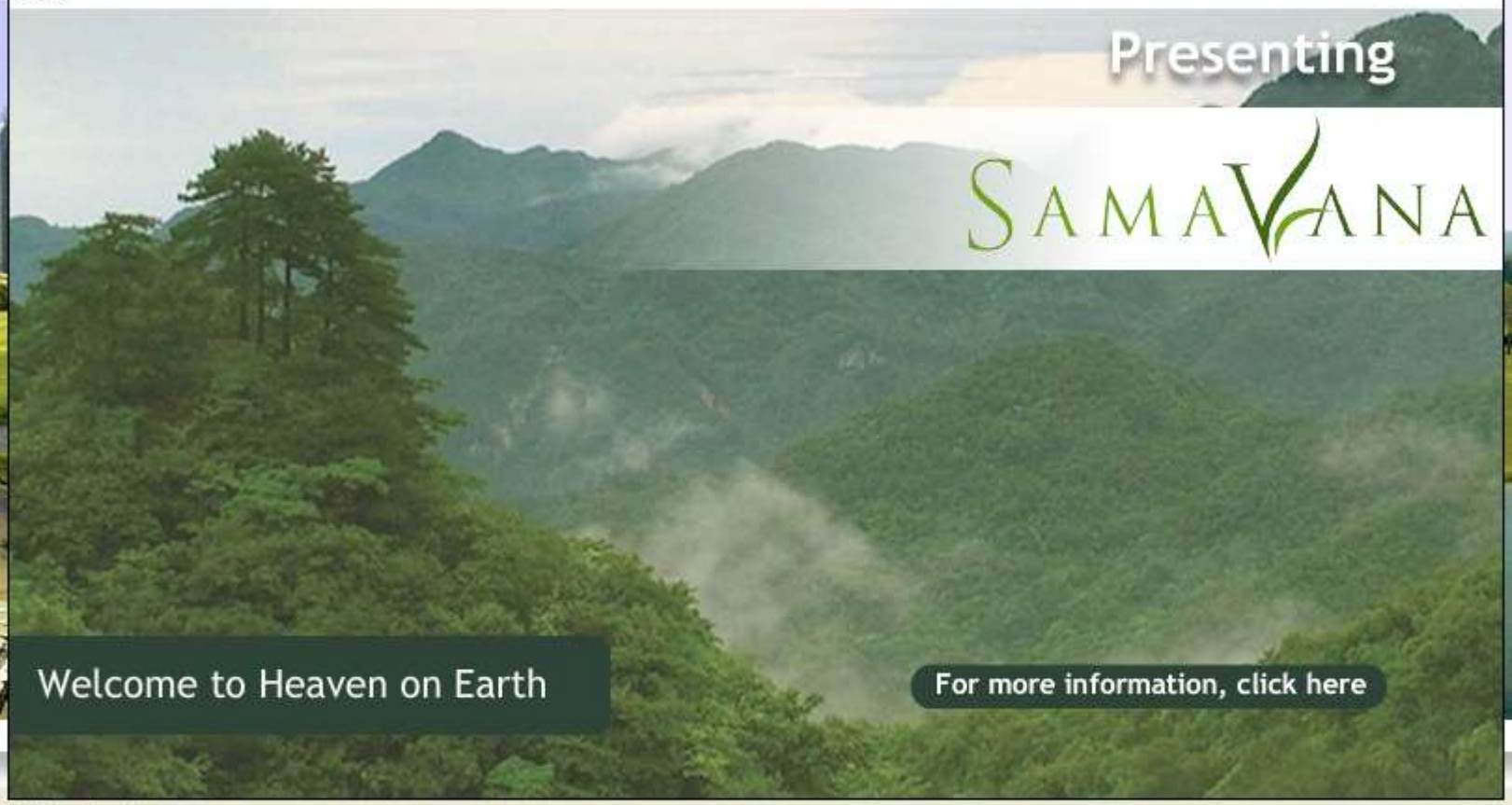
The Spaces In-Between:
An Introduction to Urban Design & Planning

Desire to become the next Silicon Valley or Detroit is an important driver of urban form

"The lemming effect."

– *Silicon Valley CEO*

close



Latest Projects

DLF Gardencity
Gurgaon

DLF Gardencity
Indore, Phase II

King's Court, GK II
New Delhi

Queen's Court, GK-II
New Delhi

Alameda Sector 73
Gurgaon

The Belaire
Gurgaon

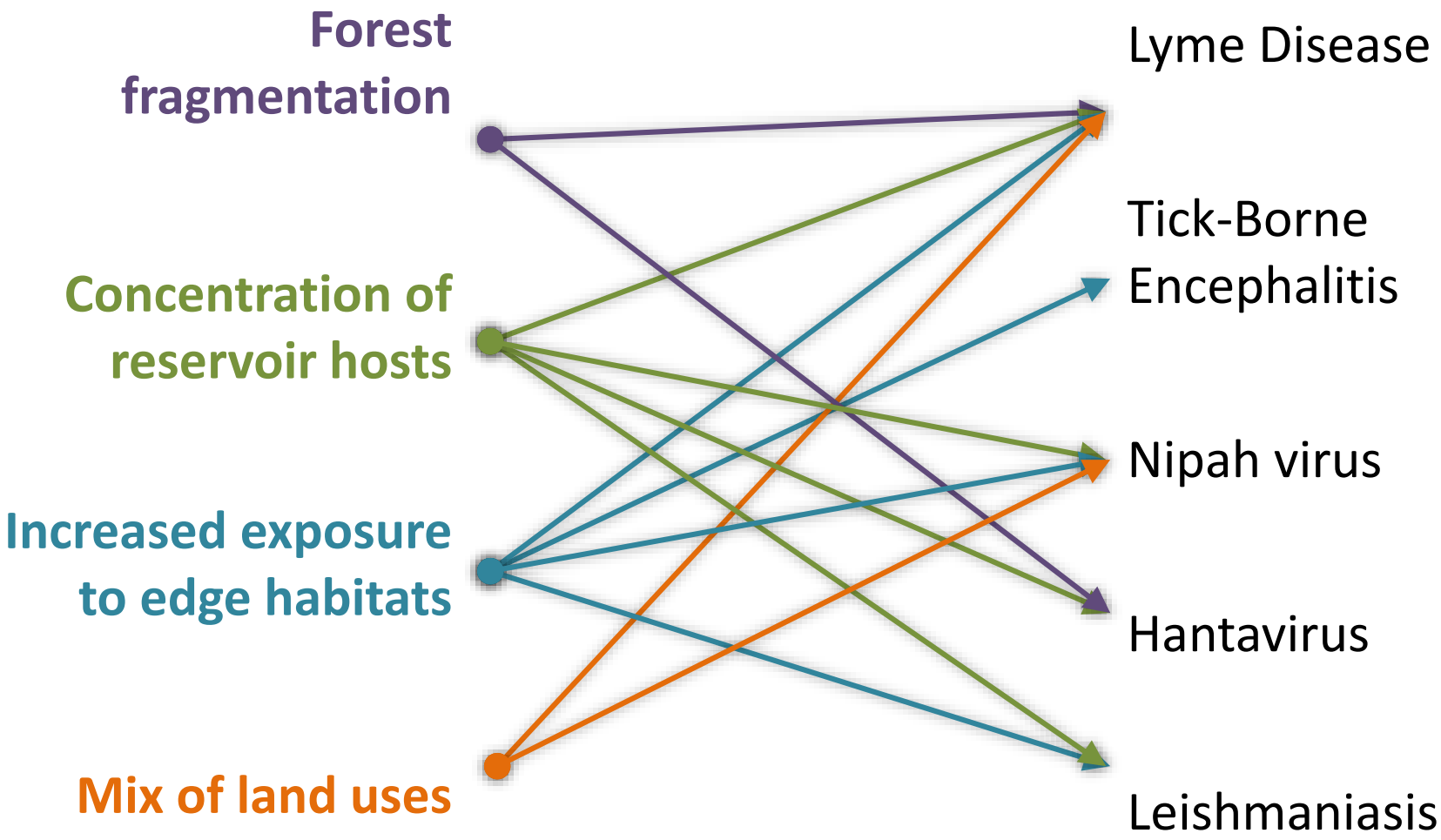
Photo: K. C. Seto

Photo: K. C. Seto

The Need for an Urbanization Science
Question 3

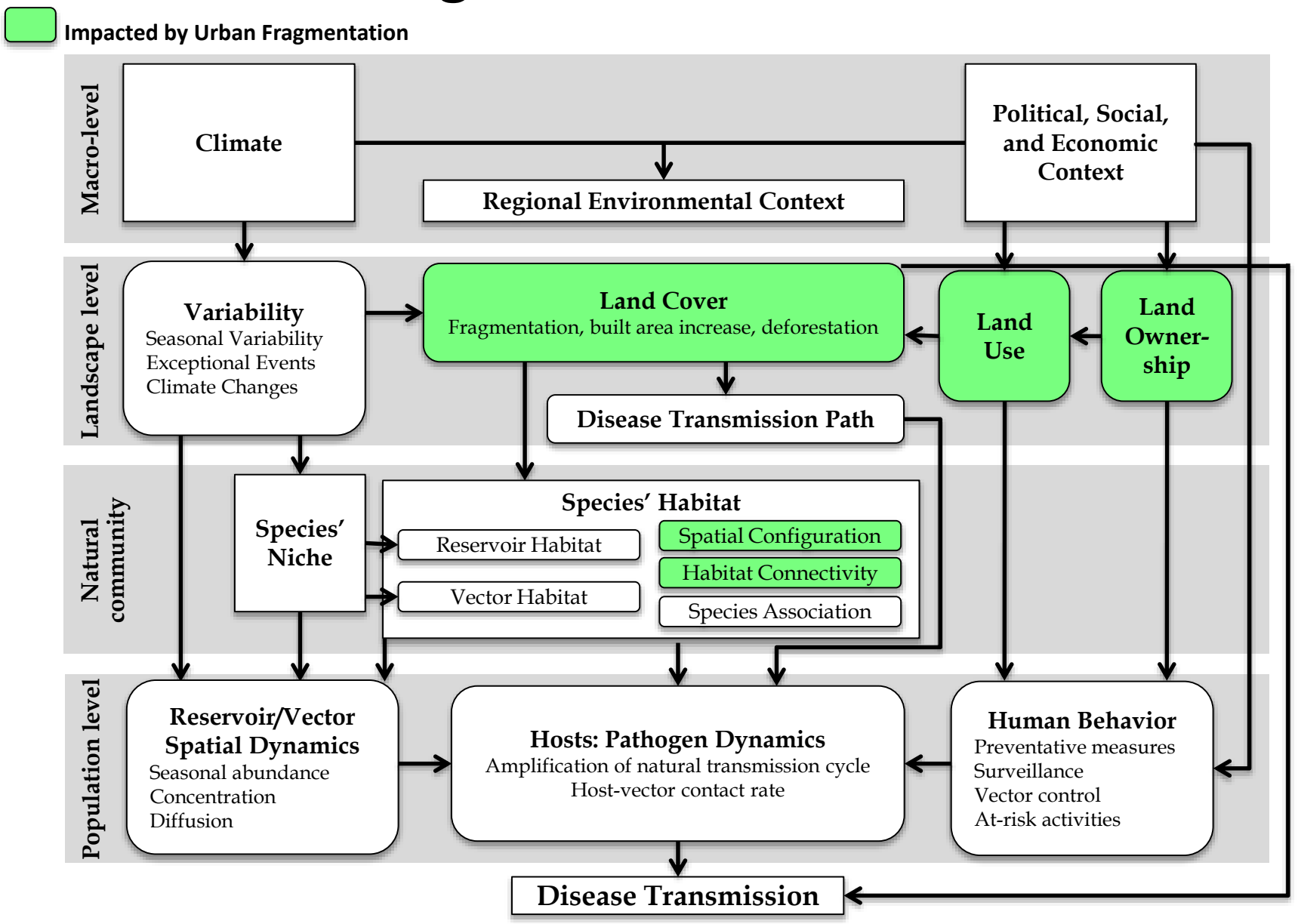
Do our theories and models reflect and capture contemporary processes?

Urbanization and Infectious Diseases



(Jackson et al. 2006; Glavanakov et al. 2001; Chaves et al. 2008; Suzán et al. 2008; Randolph 2001; Field 2009)

Land Change and Disease Transmission



Adapted from: Lambin et al., 2008.

Science 27 FEBRUARY 2015 • VOL 347 ISSUE 6225 1258832-1

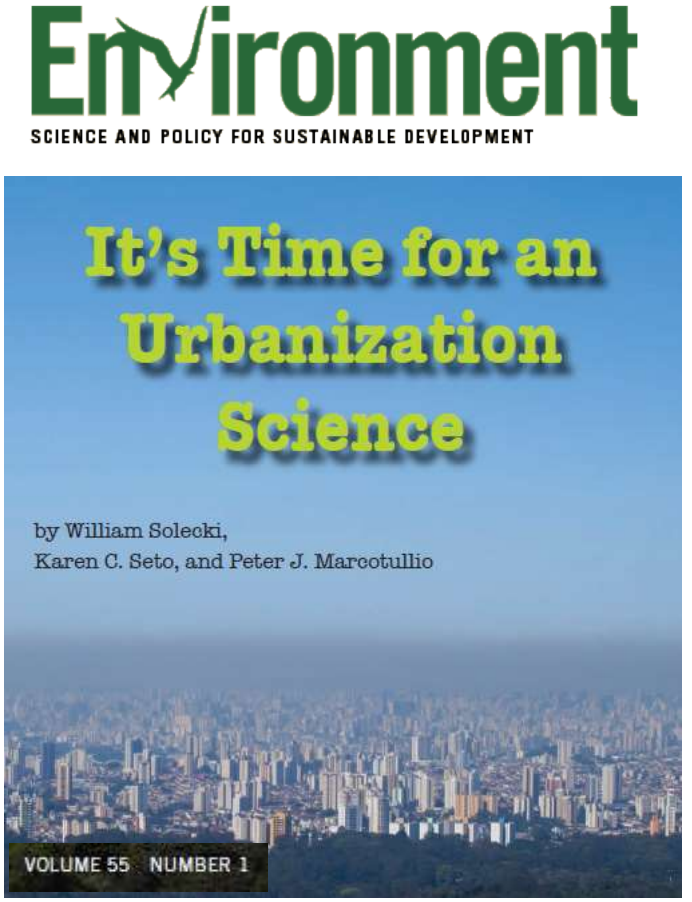
REVIEW

SUSTAINABILITY

Systems integration for global sustainability

Jianguo Liu,[1*] Harold Mooney,[2] Vanessa Hull,[1] Steven J. Davis,[3] Joanne Gaskell,[4] Thomas Hertel,[5] Jane Lubchenco,[6] Karen C. Seto,[7] Peter Gleick,[8] Claire Kremen,[9] Shuxin Li[1]

Global sustainability challenges, from maintaining biodiversity to providing clean air and water, are closely interconnected yet often separately studied and managed. Systems integration—holistic approaches to integrating various components of coupled human and natural systems—is critical to understand socioeconomic and environmental interconnections and to create sustainability solutions. Recent advances include the development and quantification of integrated frameworks that incorporate ecosystem services, environmental footprints, planetary boundaries, human-nature nexuses, and telecoupling. Although systems integration has led to fundamental discoveries and practical applications, further efforts are needed to incorporate more human and natural components simultaneously, quantify spillover systems and feedbacks, integrate multiple spatial and temporal scales, develop new tools, and translate findings into policy and practice. Such efforts can help address important knowledge gaps, link seemingly unconnected challenges, and inform policy and management decisions.



SUSTAINABLE DEVELOPMENT GOALS

GOAL 11

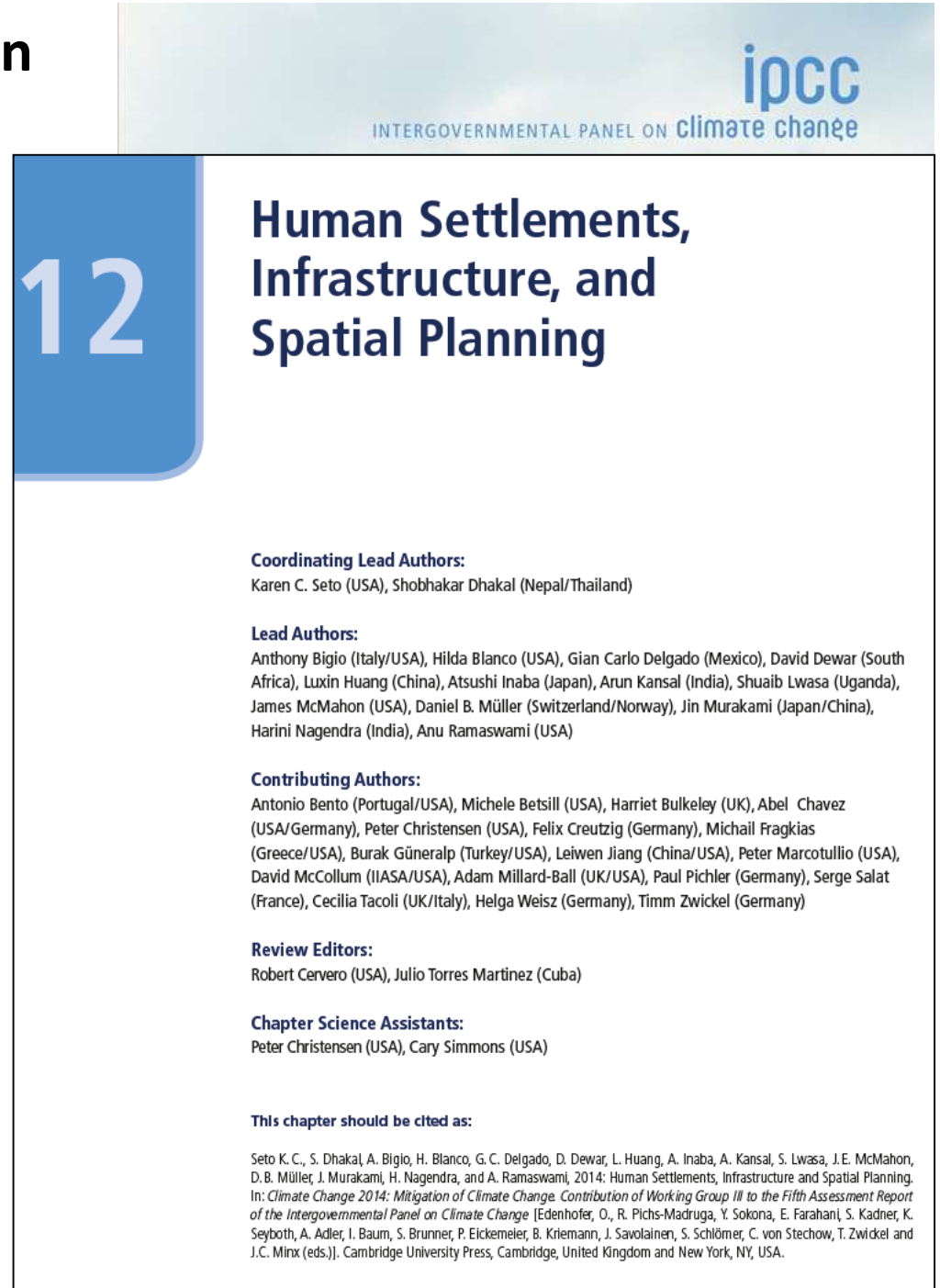
MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE


If the top 50 emitting cities were a single country, it would rank 3rd in emissions behind China and the U.S.

IPCC AR5: New urban mitigation chapter

2 Coordinating Lead Authors
30 Authors
2 Review Editors
2 Chapter Science Assistants

More than **4** years
More than **110** pages
Nearly **700** references
More than **3,000** comments



ipcc
INTERGOVERNMENTAL PANEL ON climate change

12

Human Settlements, Infrastructure, and Spatial Planning

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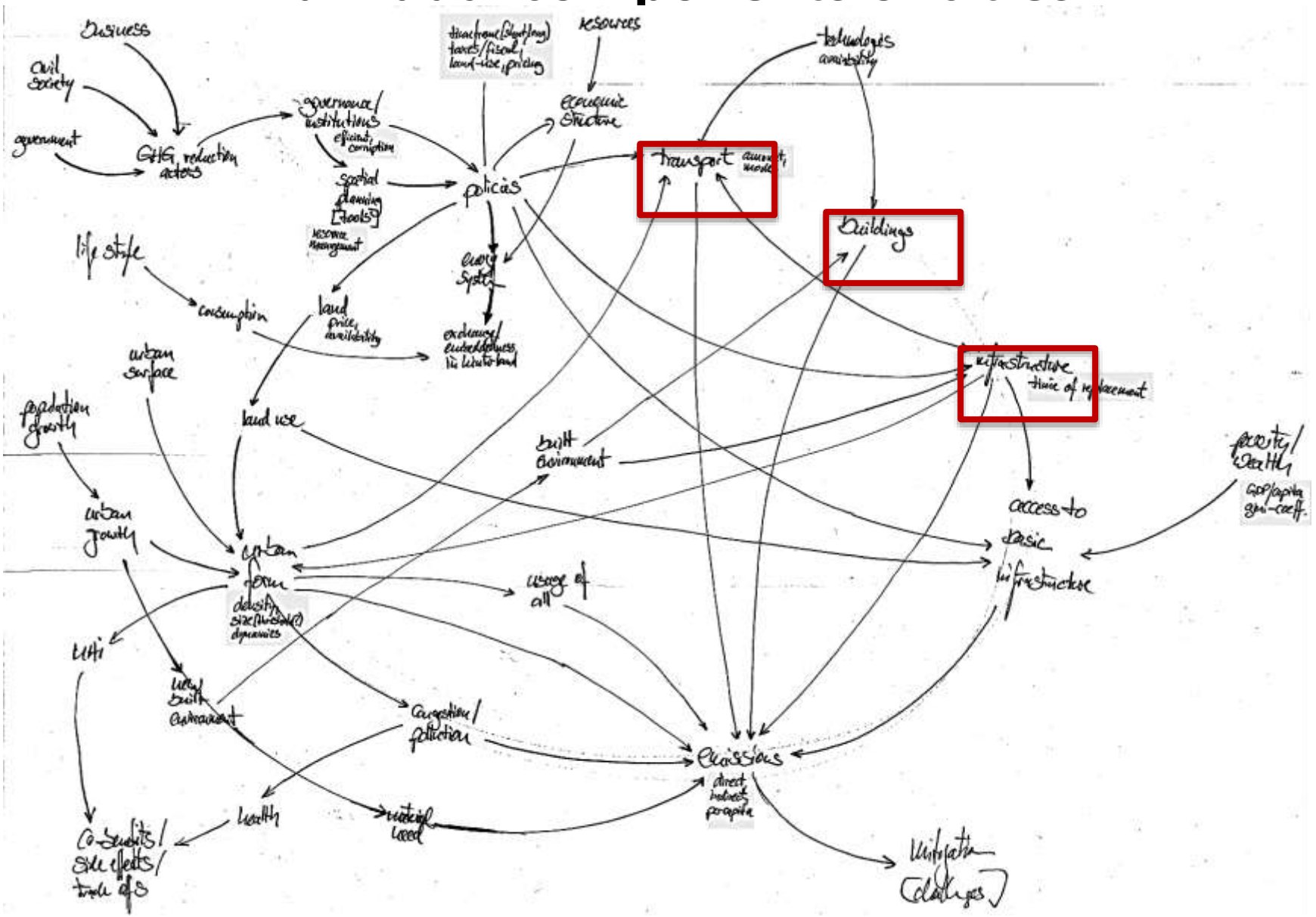
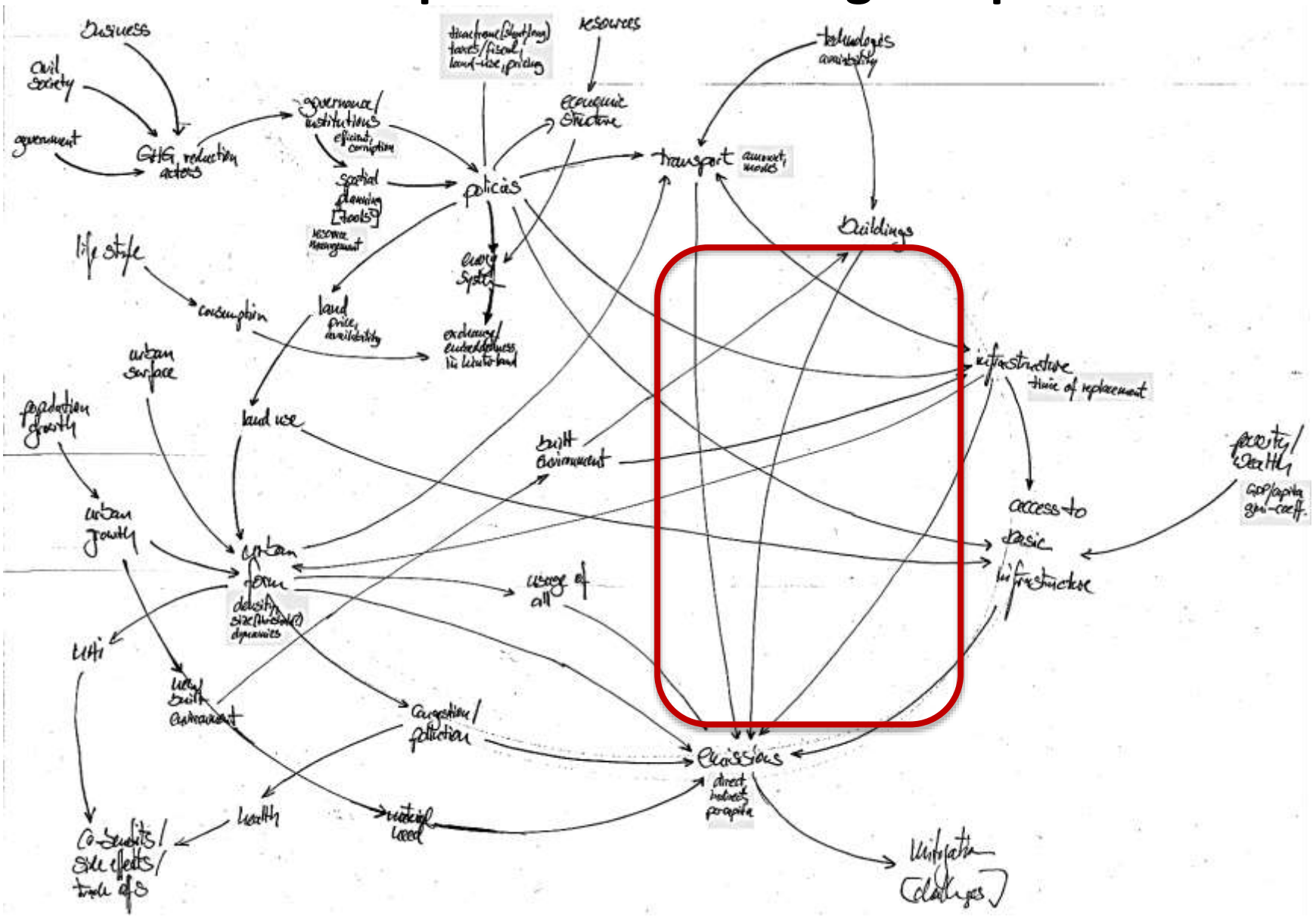
This chapter should be cited as:

Seto K. C., S. Dhakal, A. Bigio, H. Blanco, G. C. Delgado, D. Dewar, L. Huang, A. Inaba, A. Kansal, S. Lwasa, J.E. McMahon, D.B. Müller, J. Murakami, H. Nagendra, and A. Ramaswami, 2014: Human Settlements, Infrastructure and Spatial Planning. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Strong scientific understanding of individual components of cities



Weak scientific knowledge of complexities, dynamics, and interdependencies among components




AURORA

The battle to ensure that our planet remains a hospitable and sustainable home for the uman species will be won or lost in the major urban areas."

- Maurice Strong, Secretary General, UN Conference on Environment & Development, 1992