Beyond Urban Expansion:

Challenges and Opportunities for Urban Sustainability

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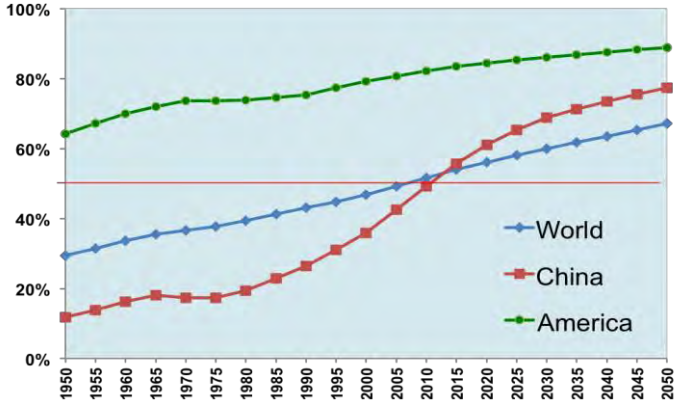
Outline

- Urbanization in China
- Data gaps and critical research needs
- Effective mechanisms for strengthening the science-policy interface

Urban expansion in China: Rapid, massive, regionally uneven



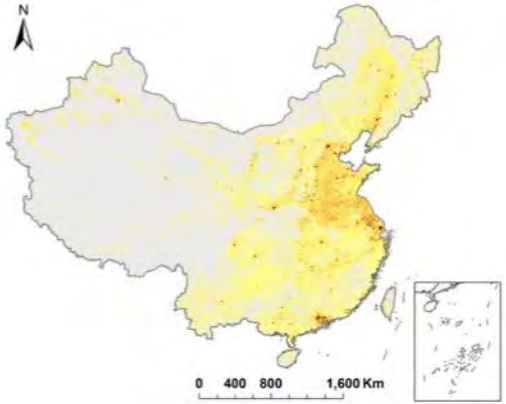
Percent of Urban Population from 1950-2050

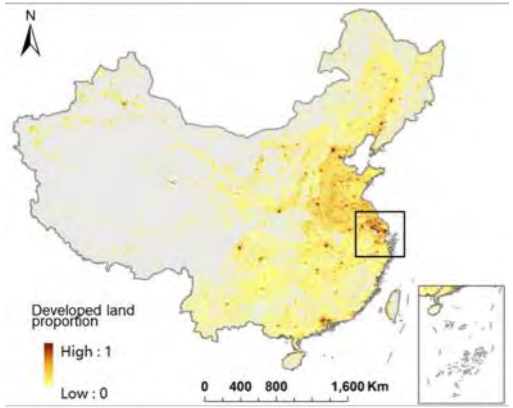
Urban population increased by 640 M

- 1978: 166.5 M (17.9%)
- 2018: 813 .4 M (59.6%)
- 2030: 1 Billion (65%)

Developed land increased by > 80,000 km^2

2000

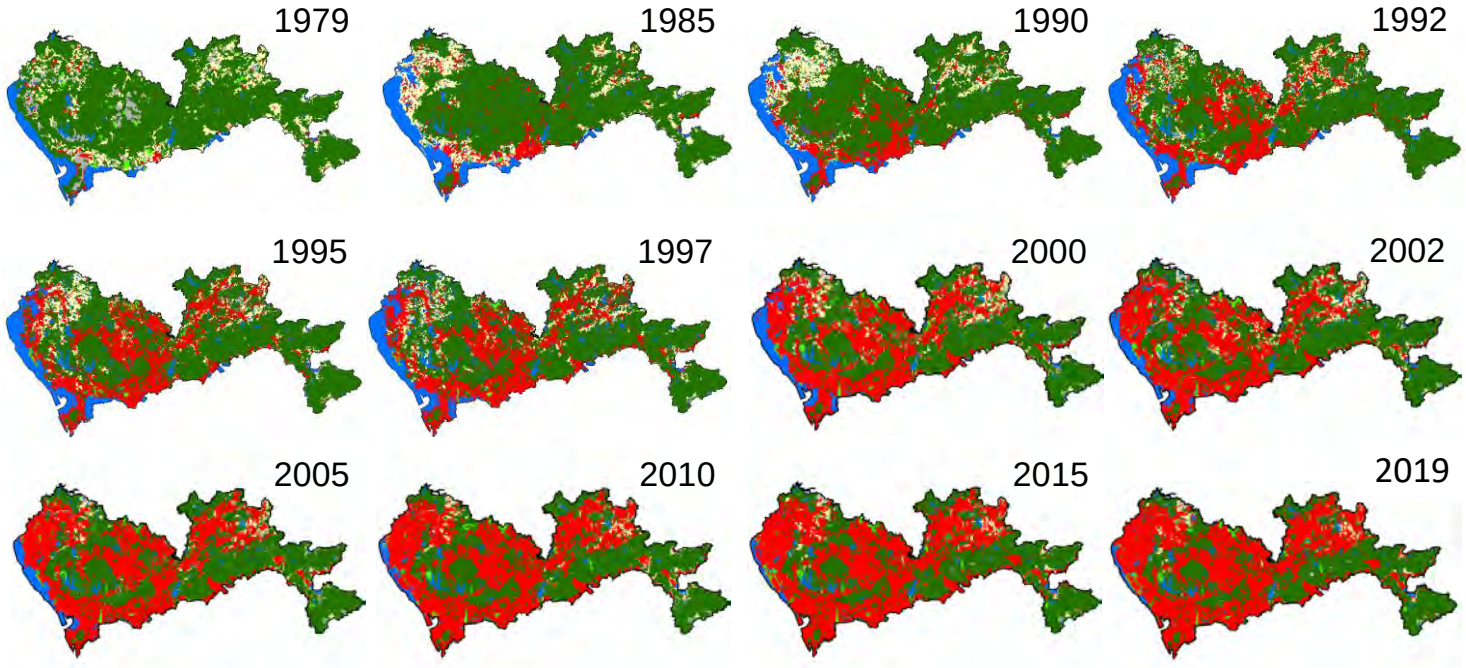




2015

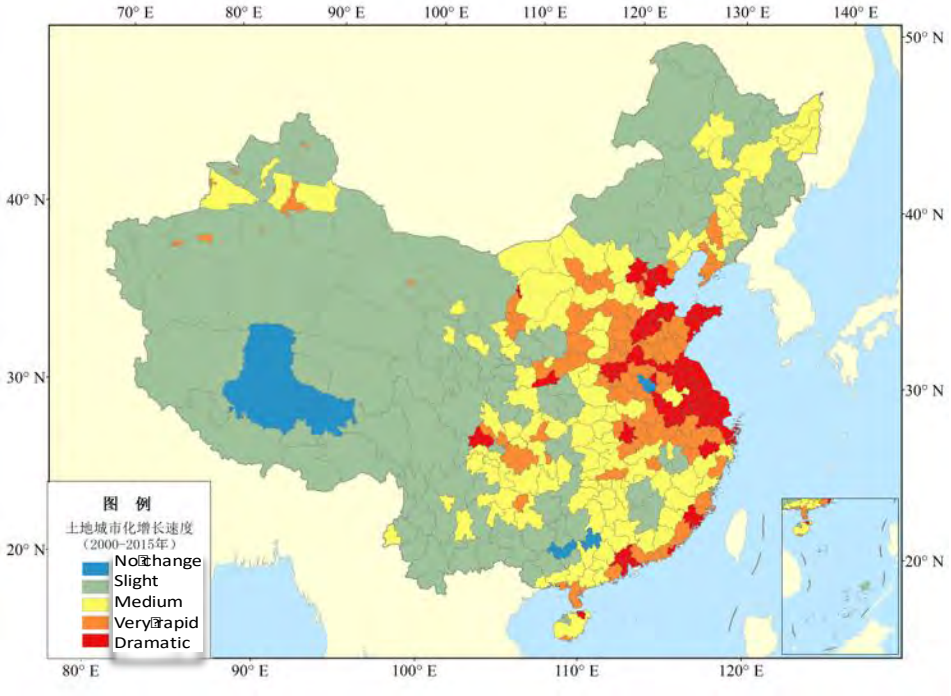
Urban expansion in China: Rapid, massive, regionally uneven

Shenzhen: from a fishery town to a megacity with more than 20M people in 40 years

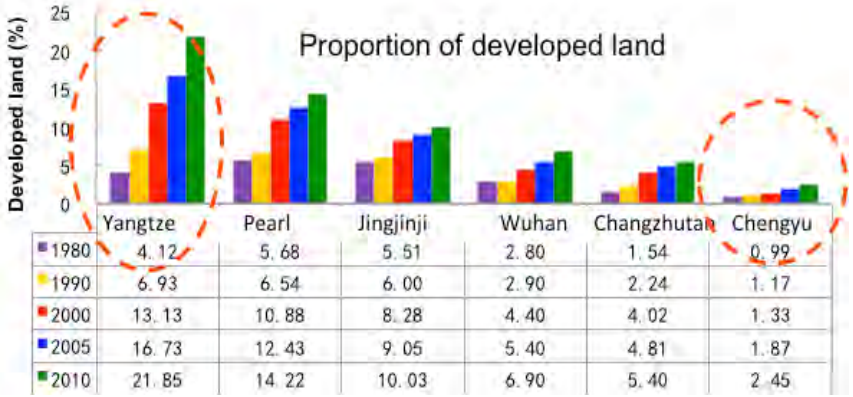


Urban expansion in China: Rapid, massive, regionally uneven

Urban expansion in China for 2000-2015: Large spatial variations



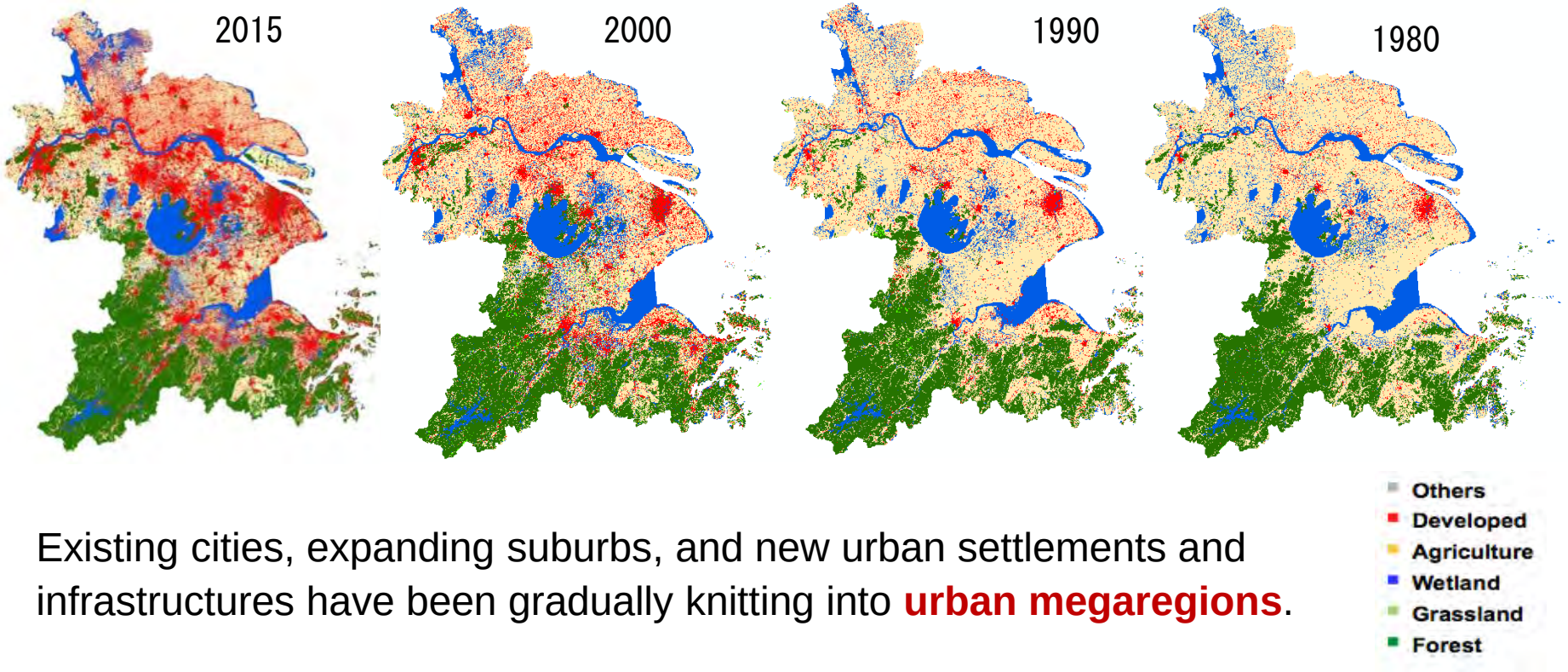
Regions	2000(%)	2015(%)	Change(%)
West	0.44	0.64	**0.20**
Centre	4.54	5.96	1.42
East	8.16	11.75	**3.59**
North-east	2.40	2.70	0.30



Beyond urban expansion: New characteristics of contemporary urbanization in China

Urban megaregions as a “new” form of urbanization

Yangtze River Delta



Existing cities, expanding suburbs, and new urban settlements and infrastructures have been gradually knitting into **urban megaregions**.

Beyond urban expansion: New characteristics of contemporary urbanization in China

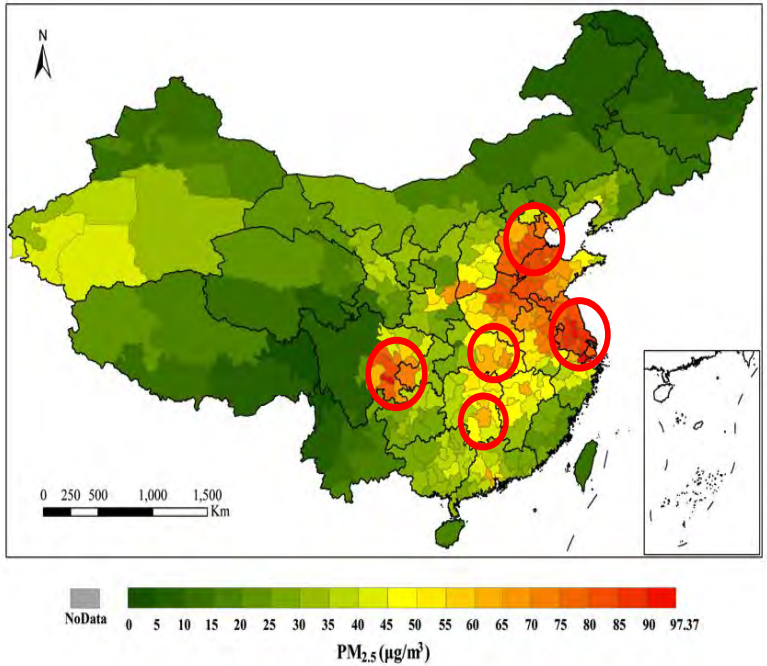
Urban megaregions as a “new” form of urbanization

- “National New-Type Urbanization Plan” (2014): urban megaregion or urban agglomeration would be the main type of urban spatial form in the next decade (Fang et al. 2016).
- Planned for five national, nine regional, and six sub-regional urban megaregions

The potential environmental risks of forming urban megaregions warrant further research.

Environmental impacts of emerging Urban Megaregions

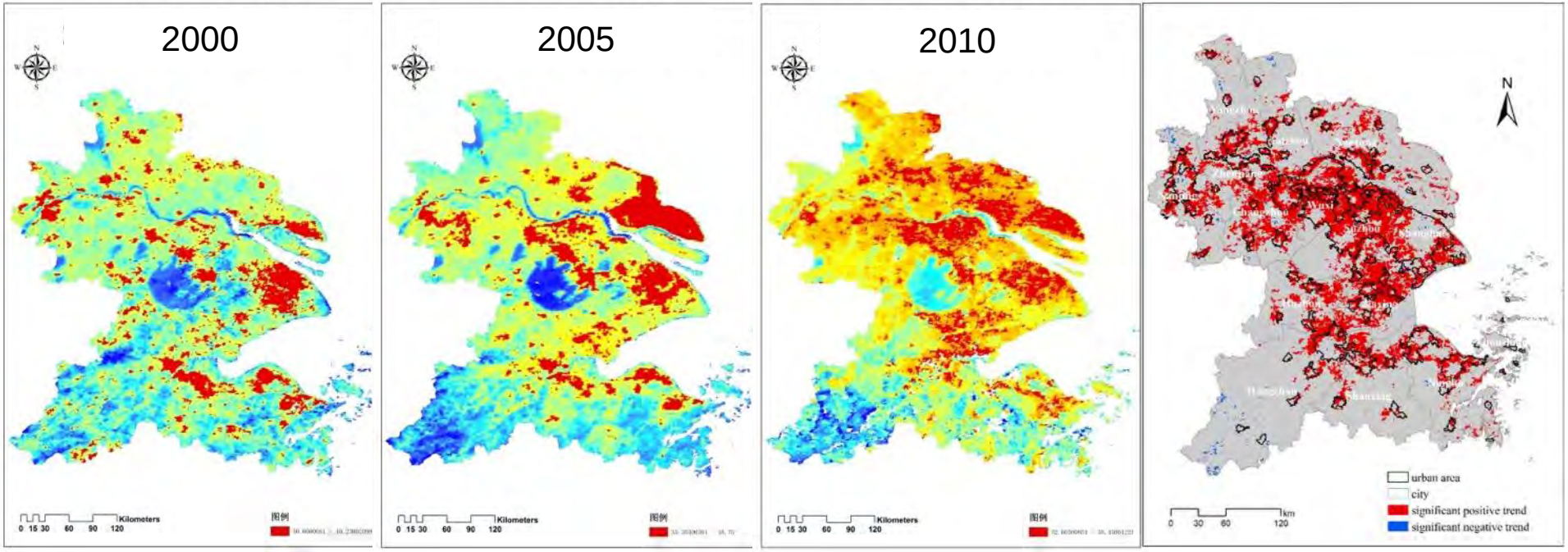
- With the emergence of urban megaregions, environmental problems at the city scale expanded to the region level, and gradually became **regional issues**.



Environmental impacts of emerging Urban Megaregions

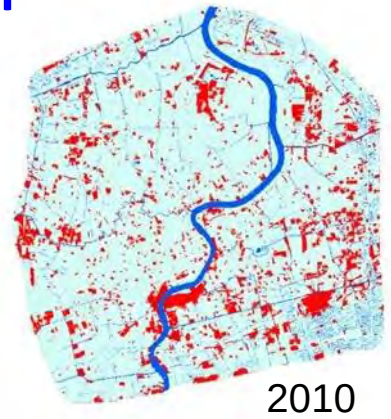
Increasingly become a regional issue: The size of urban heat islands are expanding, and gradually forming urban heat “archipelagos”.

Land surface temperature in Yangtze River Delta megaregion



Beyond urban expansion: New characteristics of contemporary urbanization in China

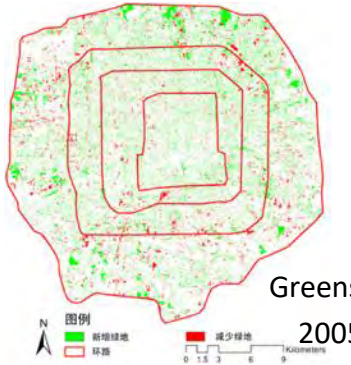
A shift from “urban expansion” to “Internal optimization (urban renewal)”：“增量扩张”到“存量优化”



Land under construction in Shanghai

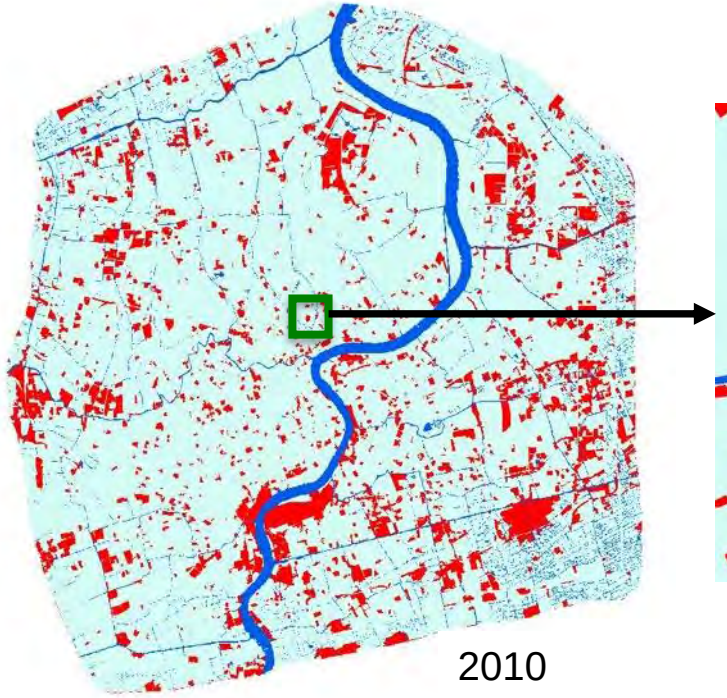
The parcel next to RCEES (8/2/2008)

The parcel next to RCEES (9/15/2012)

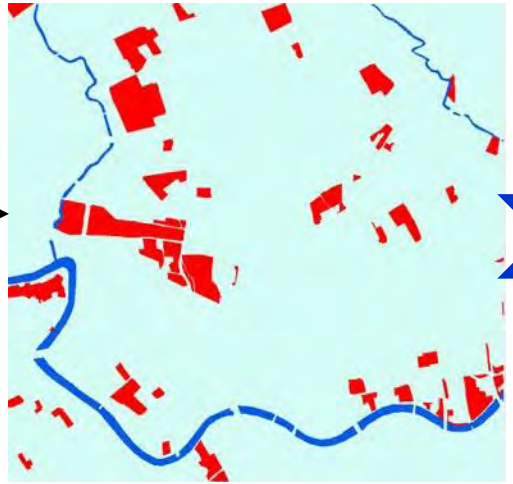


Greenspace change from 2005-2010 in Beijing

Beyond urban expansion: New characteristics of contemporary urbanization in China



2010



Internal Dynamics

Total # of patches	# of Patches under-construction	Total	Areas under-construction
30176	2155	810km^2	82km^2

Beyond urban expansion: New characteristics of contemporary urbanization in China

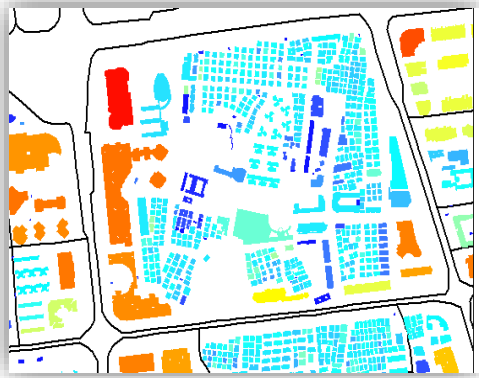
A shift from “urban expansion” to “Internal optimization (urban renewal)”： Challenges and opportunities

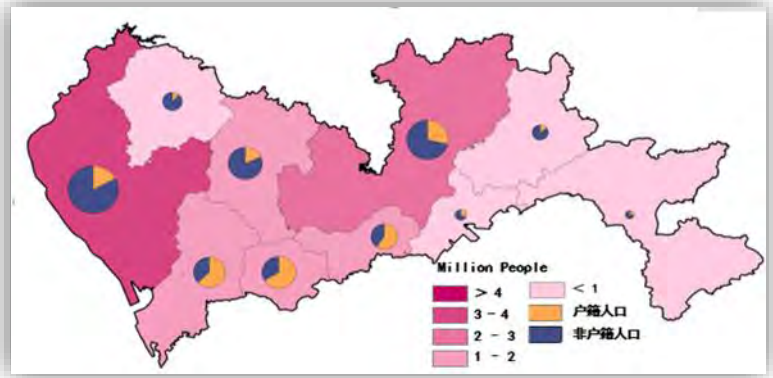
- Much less is known about the ecological consequences of internal dynamics.
- Internal city dynamics may possess ecological challenges such as loss of native species, generating noise, and temporally increasing air pollution.
- Such changes also provide enormous opportunities to introduce sustainable technologies and practices to make the city greener, more livable, resilient, and energy and resource efficient.

Move beyond urban expansion to understand the ecological consequences of internal city dynamics

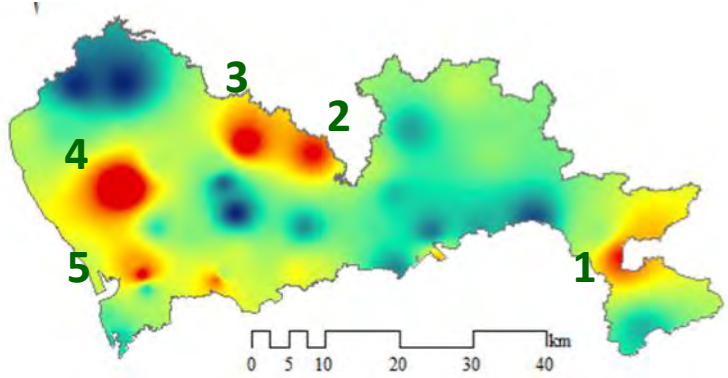
Data gaps and critical research needs

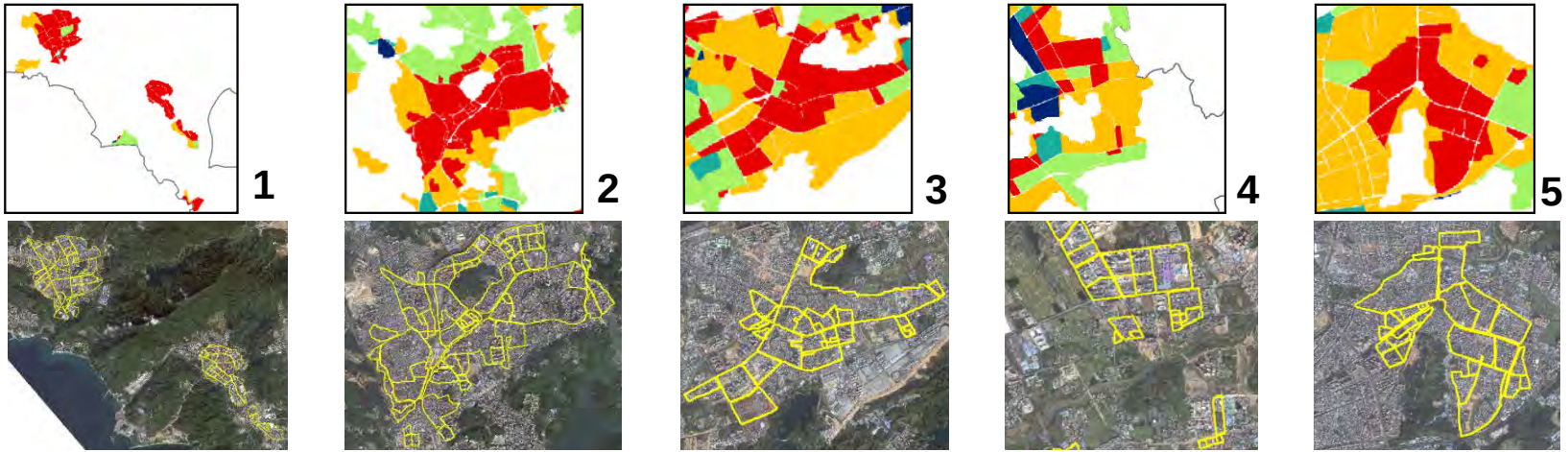
- **Too much data, not enough information.** So much earth observation data has been archived and collected every data, one of the challenges is how to convert data into information, particularly “useful” information.
- **Data gaps:** We have lots of biophysical data from earth observation, but lack of social-economic data, especially at fine-scale.





Data gaps: Lack of fine-scale social-economic data in Chinese cities





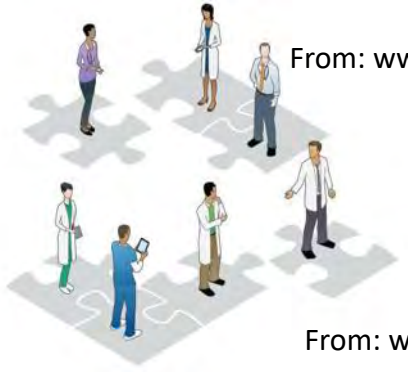
Gaps between science and policy-making

Towards knowledge co-production

- Policymakers need more actionable knowledge that are **immediately relevant** and **easy to use**, so that science-based policies can be designed and effectively implemented, especially at the local scale.
- How much we can offer? Is it relevant?

From: www.ageing.ox.ac.uk

Move beyond transdisciplinary knowledge co-production: Working together with managers and decision-makers to co-develop new science and tools for urban sustainability.



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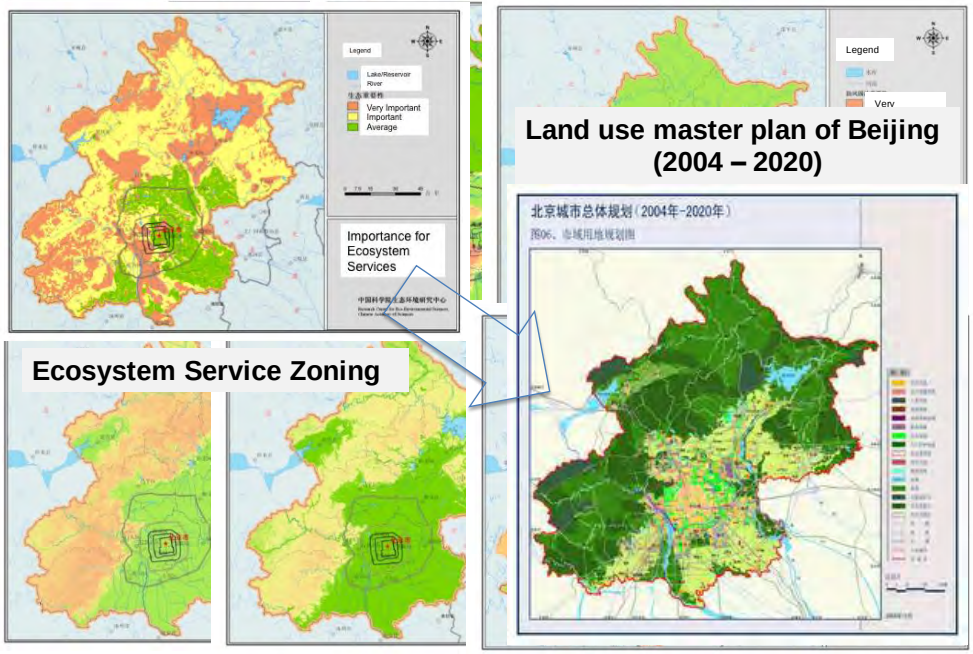
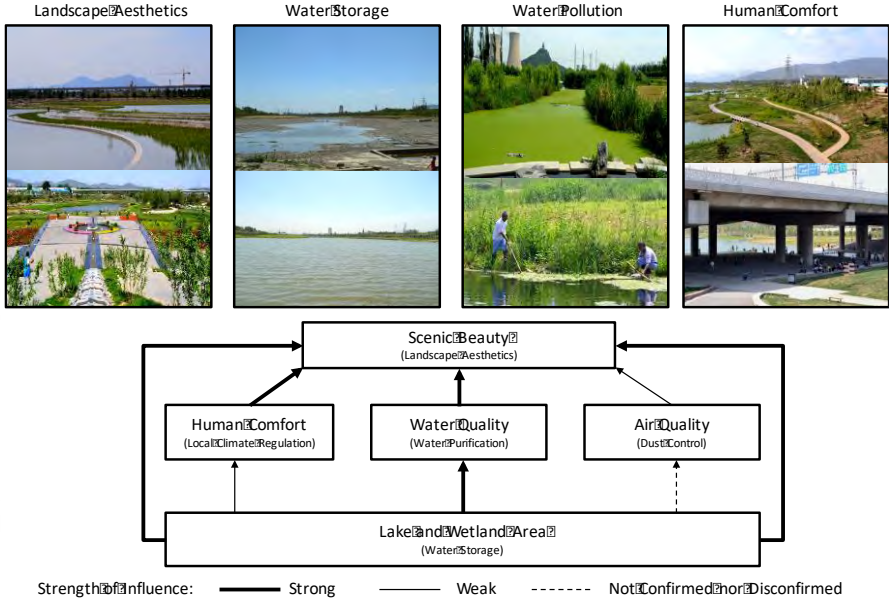
Towards knowledge co-production

Linking research to urban planning and management

Ecosystem service zoning to support the land use master plan of Beijing

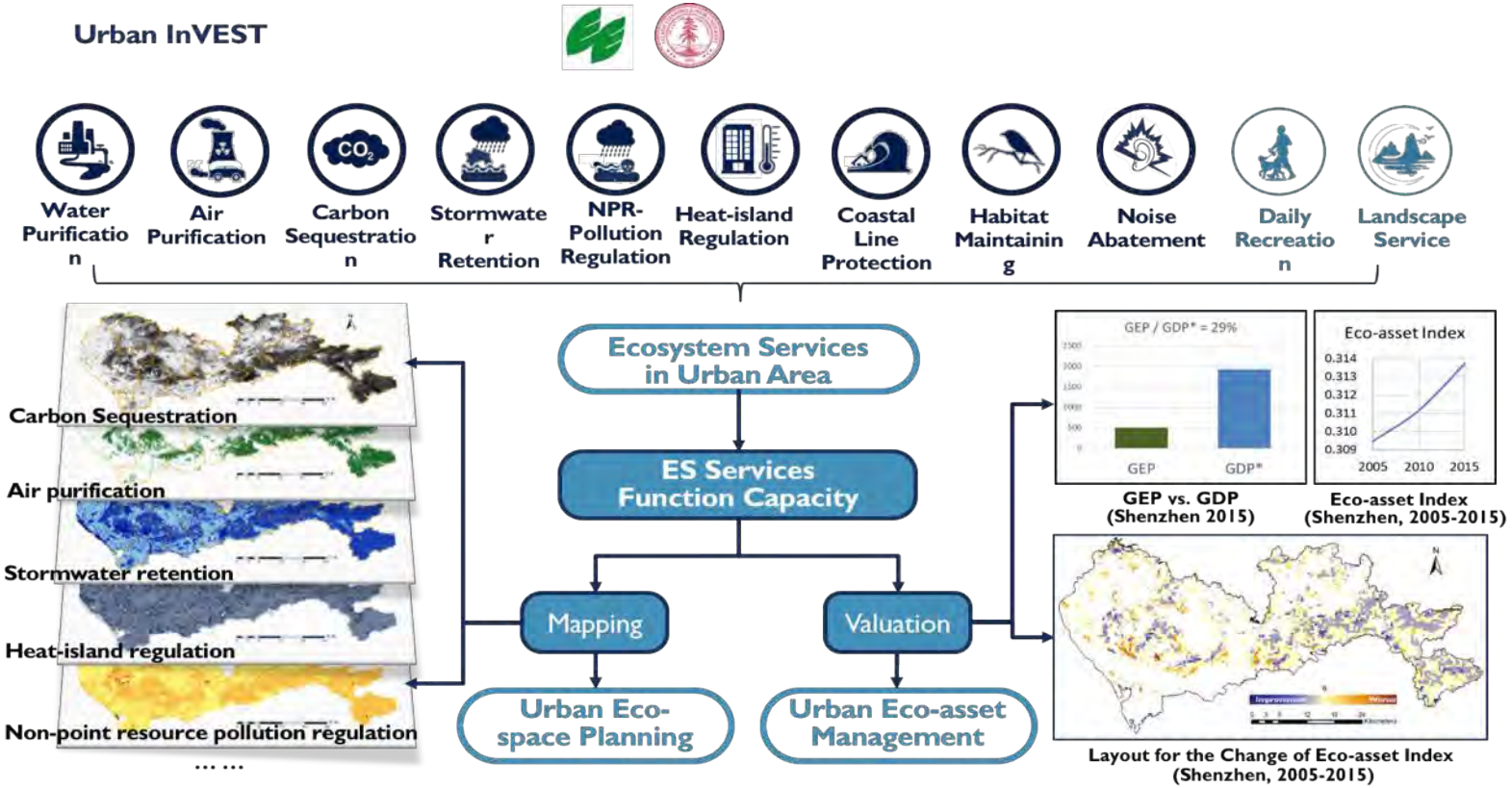


Ecological Restoration of the Yongding River Corridor

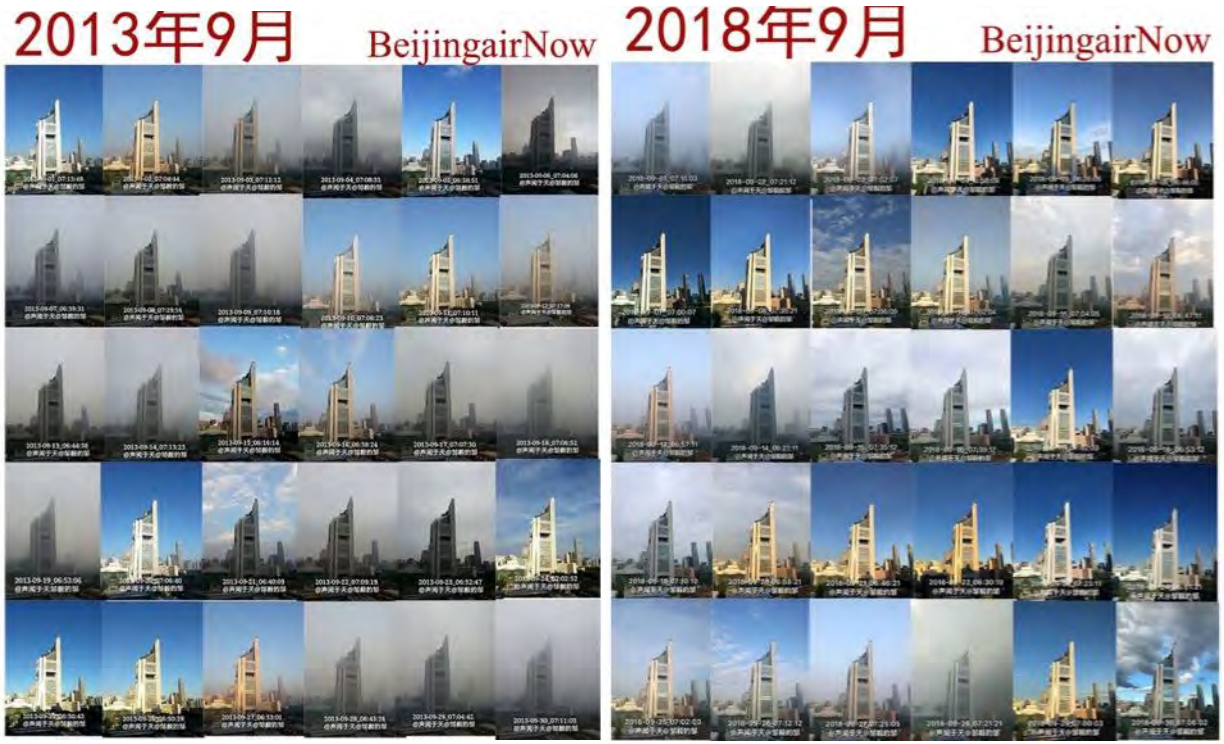


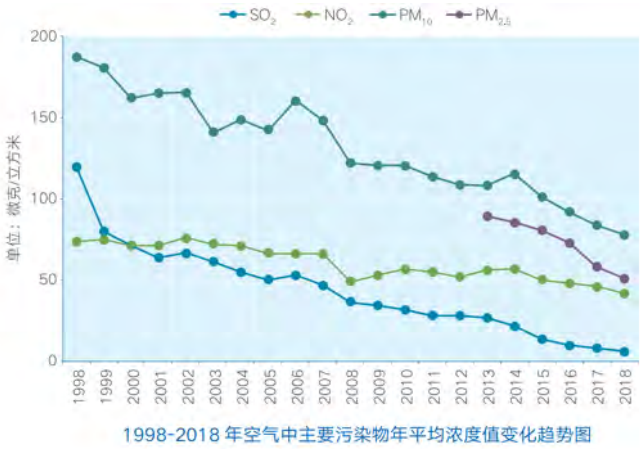
Towards knowledge co-production

Developing new tools to support urban planning and management



Urban sustainability is a never-ending journey, and working together we can make change happen.





1998-2018 年空气中主要污染物年平均浓度值变化趋势图