



From Growth to Health Urban Sustainability Challenges in China

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Outline

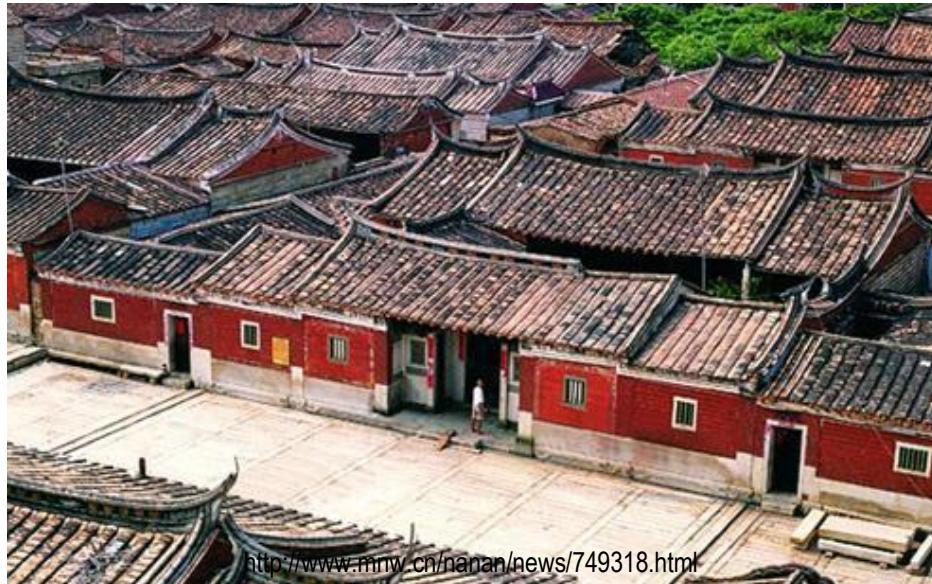
1. **About Me and My Special Experiences**
2. **China's Achievements in Urbanization**
3. **China's Challenges in Urban Sustainability**
 - ① Macroscale limits to growth
 - ② The negative lock-in effects
 - ③ The emerging health challenges
4. **Efforts to Address these Challenges**
5. **Summary and Implications**

My Circle: Zhangzhou-Beijing-New Haven-Xiamen



19 Years in Rural China

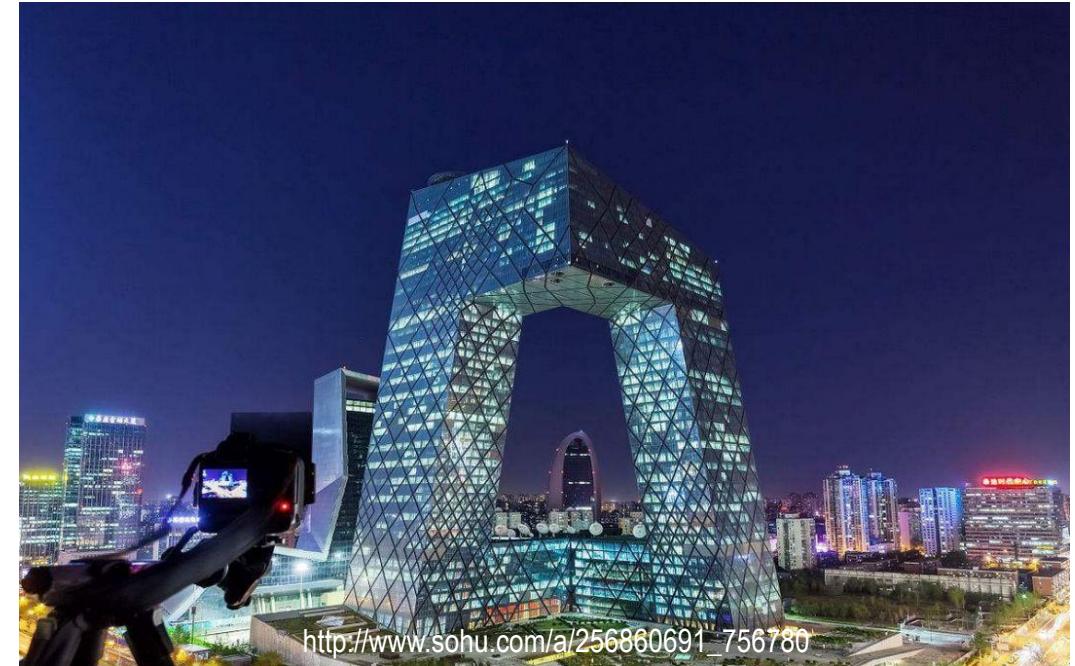
- **1981-1996.** Stayed in a coastal village in southeast China.
- **1996-2000.** Studied as a high-school student in a county.



Lack of paved roads, high-rise buildings, TVs, cars, refrigerators, ...
Eager to Become Urban Inhabitants!

10 Years in Beijing

□2000-2010. Studied at Tsinghua School of Environment, Beijing.



Beijing was quickly “Urbanized” from traditional to modern style

5 Years in New Haven, CT

□2010-2015. Worked at Yale Center for Industrial Ecology, New Haven.



Most Americans live in cities like New Haven, rather than Manhattan

Over 4 Years in Xiamen, China

□2015-present. Have been working at the Institute of Urban Environment, CAS.



Many Chinese cities were built into Manhattan style cities in \approx 10 years

Unlike my contemporaries in Yale, my parents, or my kid

I belong to a special generation of rural Chinese, who had the dream of entering cities when being a teenager, and this dream did gradually come true while we were growing up.

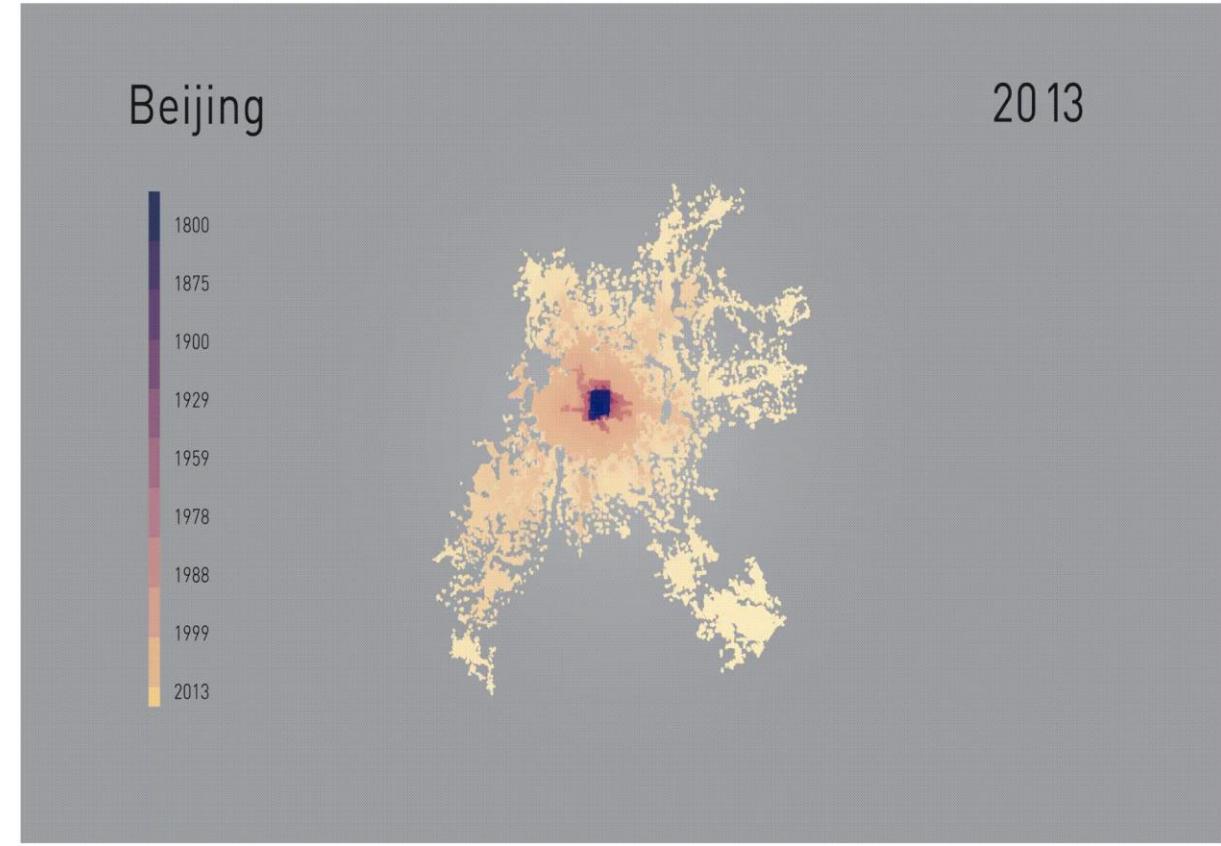
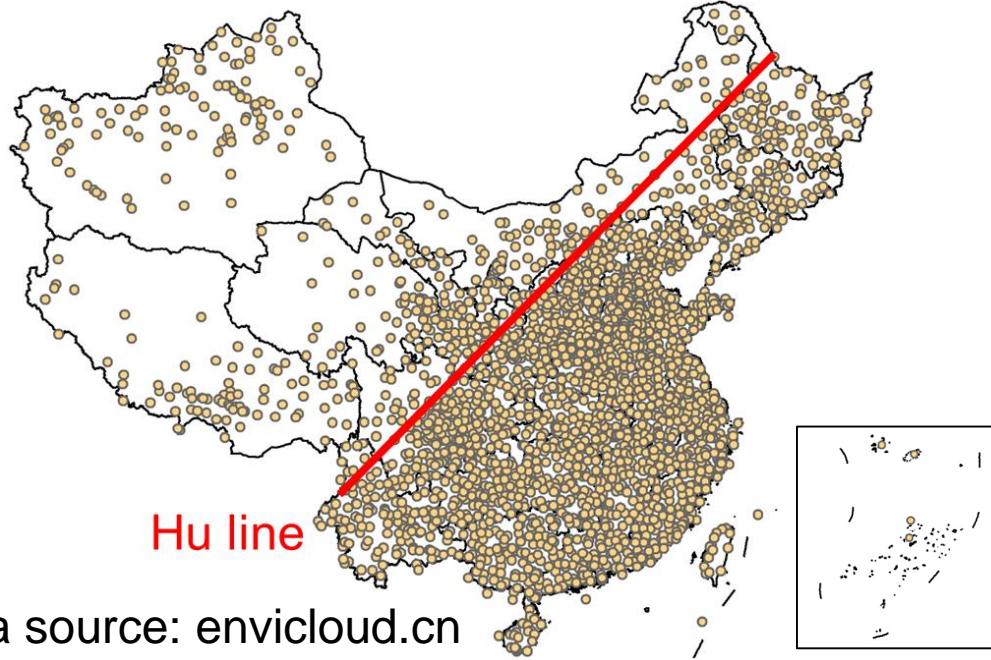
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1978-2018 was a period when China needed and had growth!

**China's urbanization since 1978 was driven by and also drove
the **GROWTH** of almost everything:
GDP, cities, city sizes, infrastructures, urban inhabitants...**

Build up ≈ 600 Cities and Significantly Expand them



Equip and Connect Cities with Modern Infrastructure

Public Transportation in Xiamen



<http://www.sohu.com/a/247707096> 414894



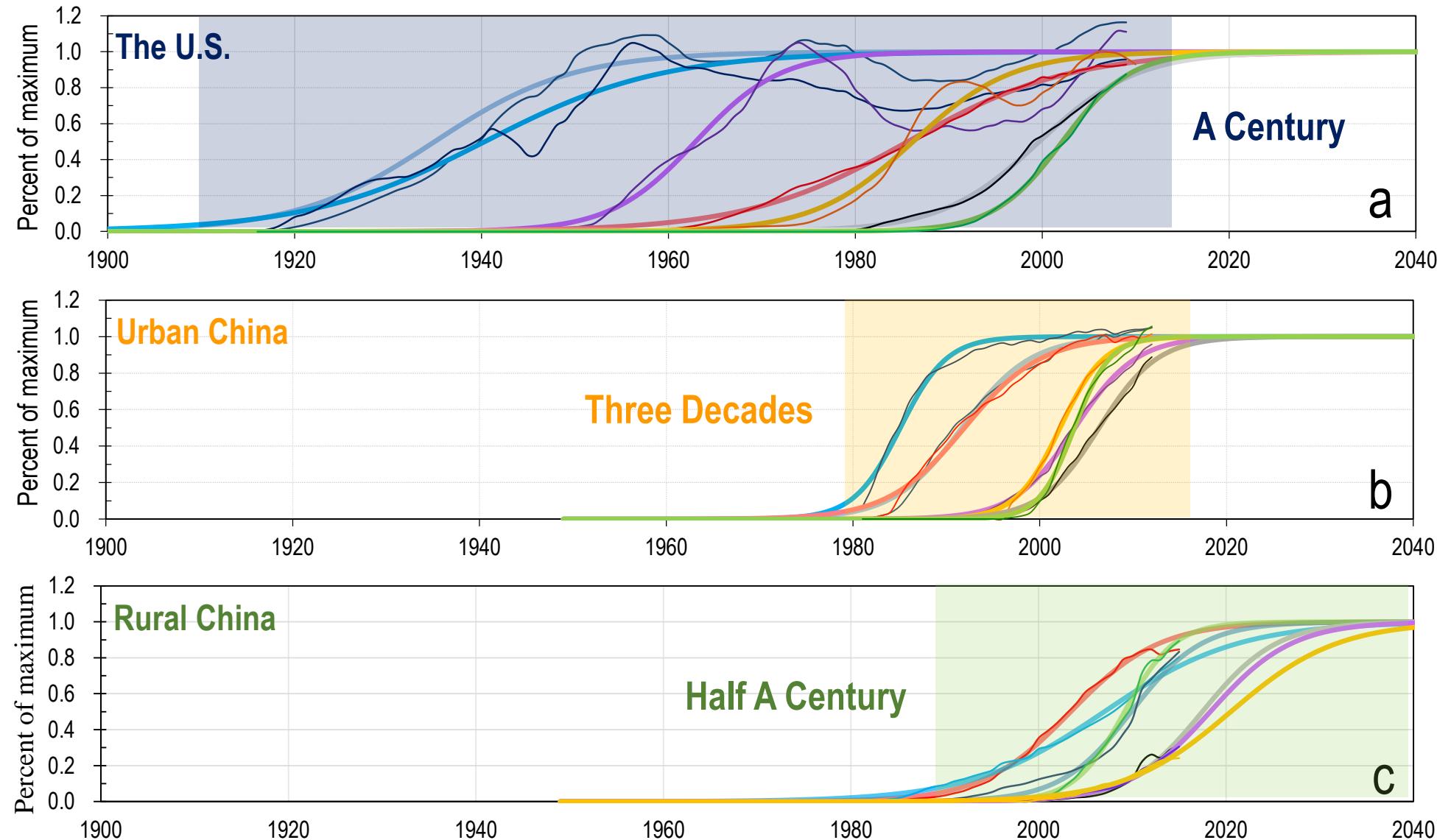
<http://www.xmgdjt.net/>

High-Speed Railway System



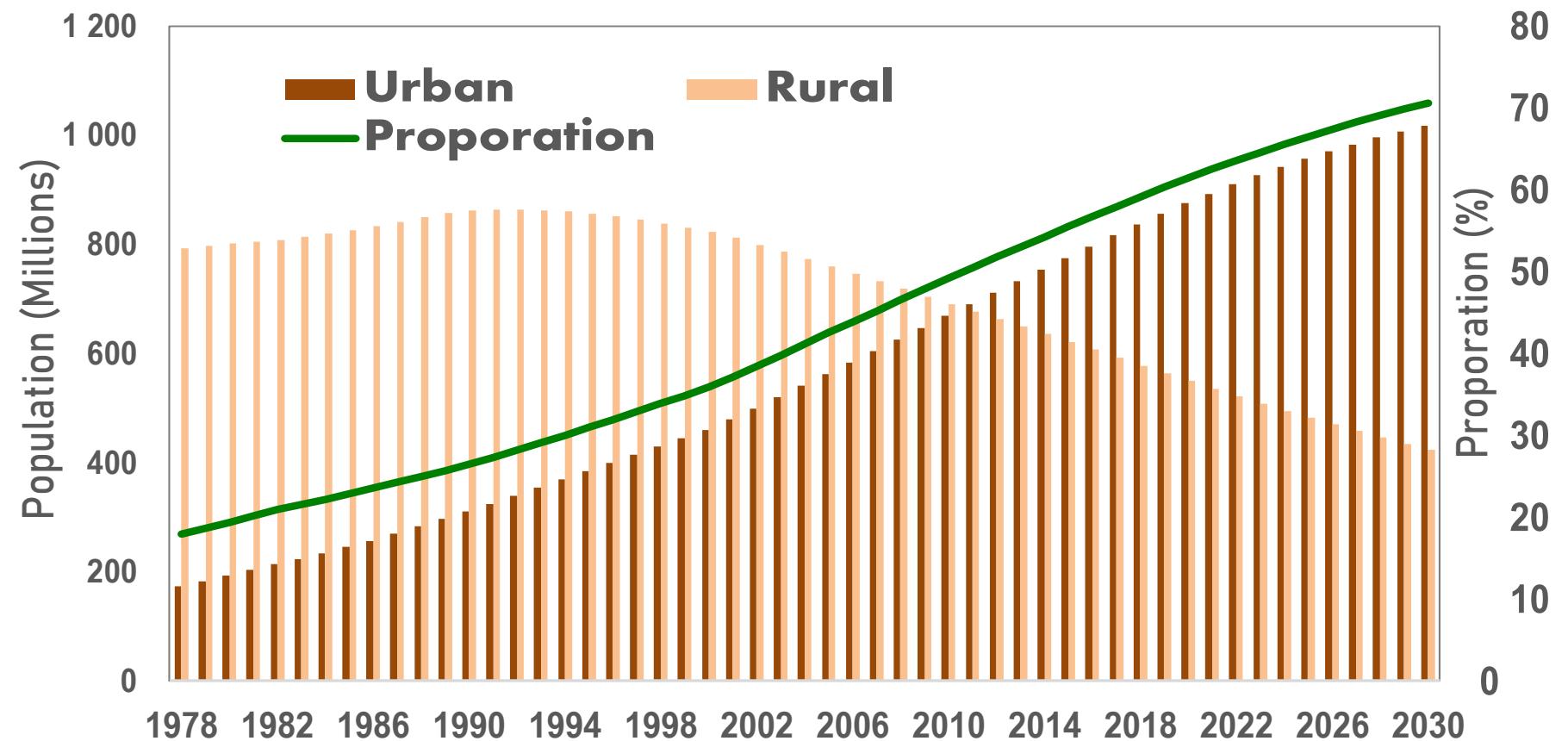
Source: Xu and Huang, *Transportation Research Part A*, 2019

Enable Chinese to Earn Modern Life Styles in 3-5 Decades



Urbanize $\approx 660,000,000$ People, 1978-2018

The proportion of Chinese living in cities increased from 18% to 59%

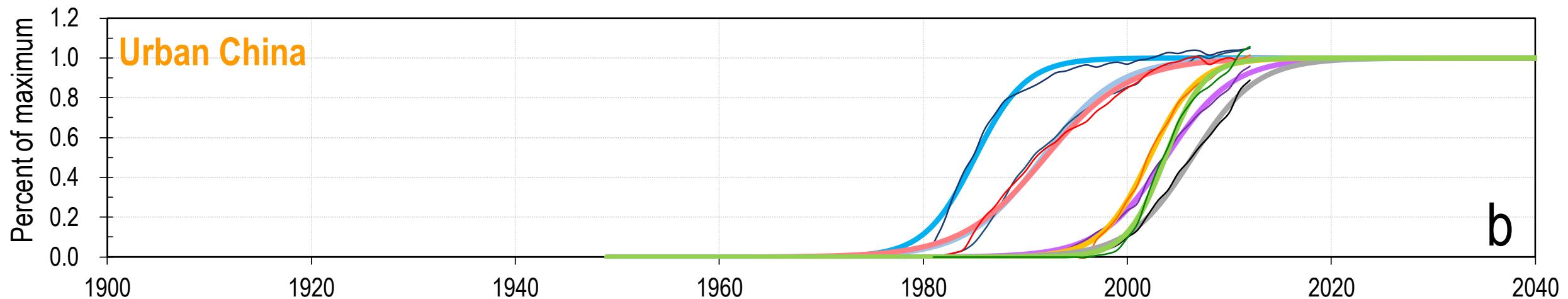


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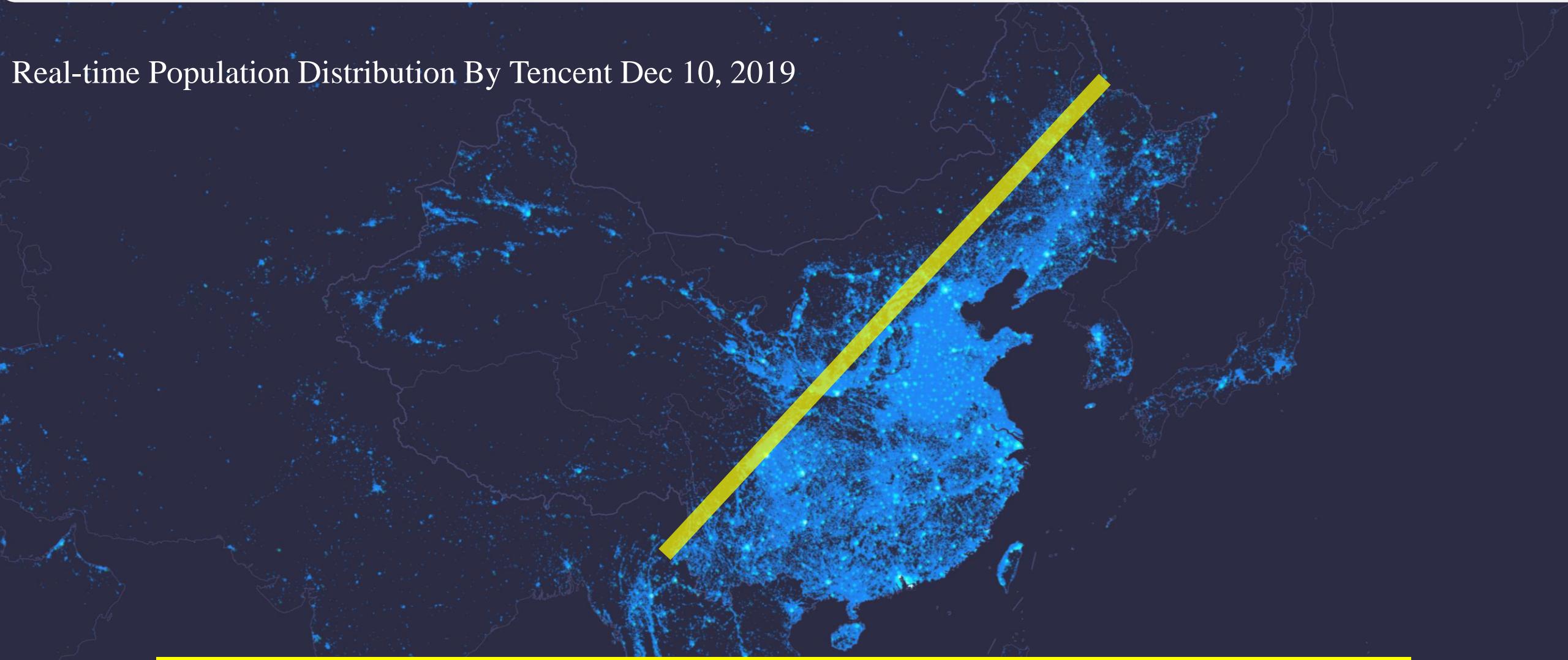
Macroscale limits to growth

The growth is approaching a plateau
due to several national-scale limits



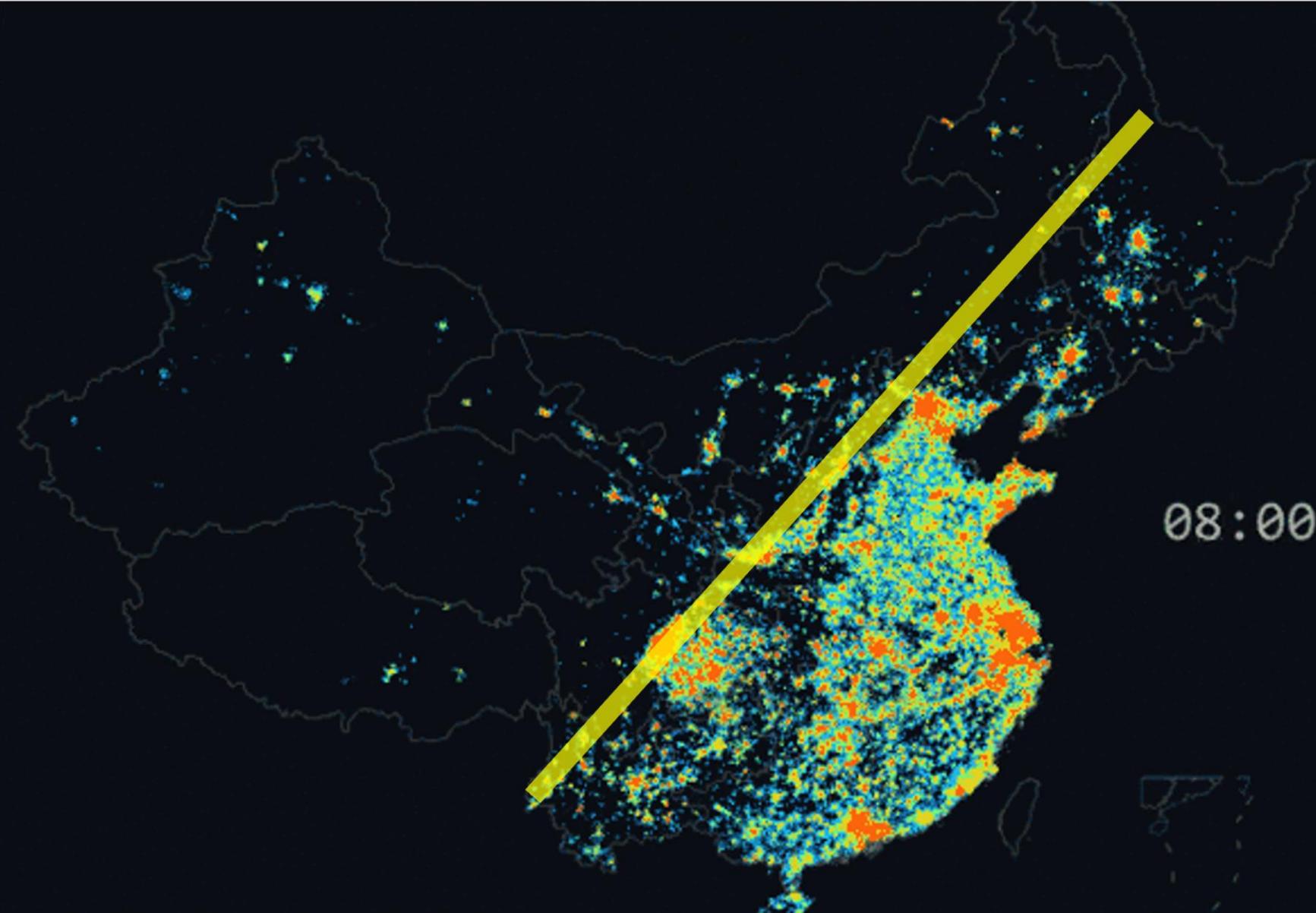
The Ecological-Geographical Limit: Hu-Huanyong Line

Real-time Population Distribution By Tencent Dec 10, 2019

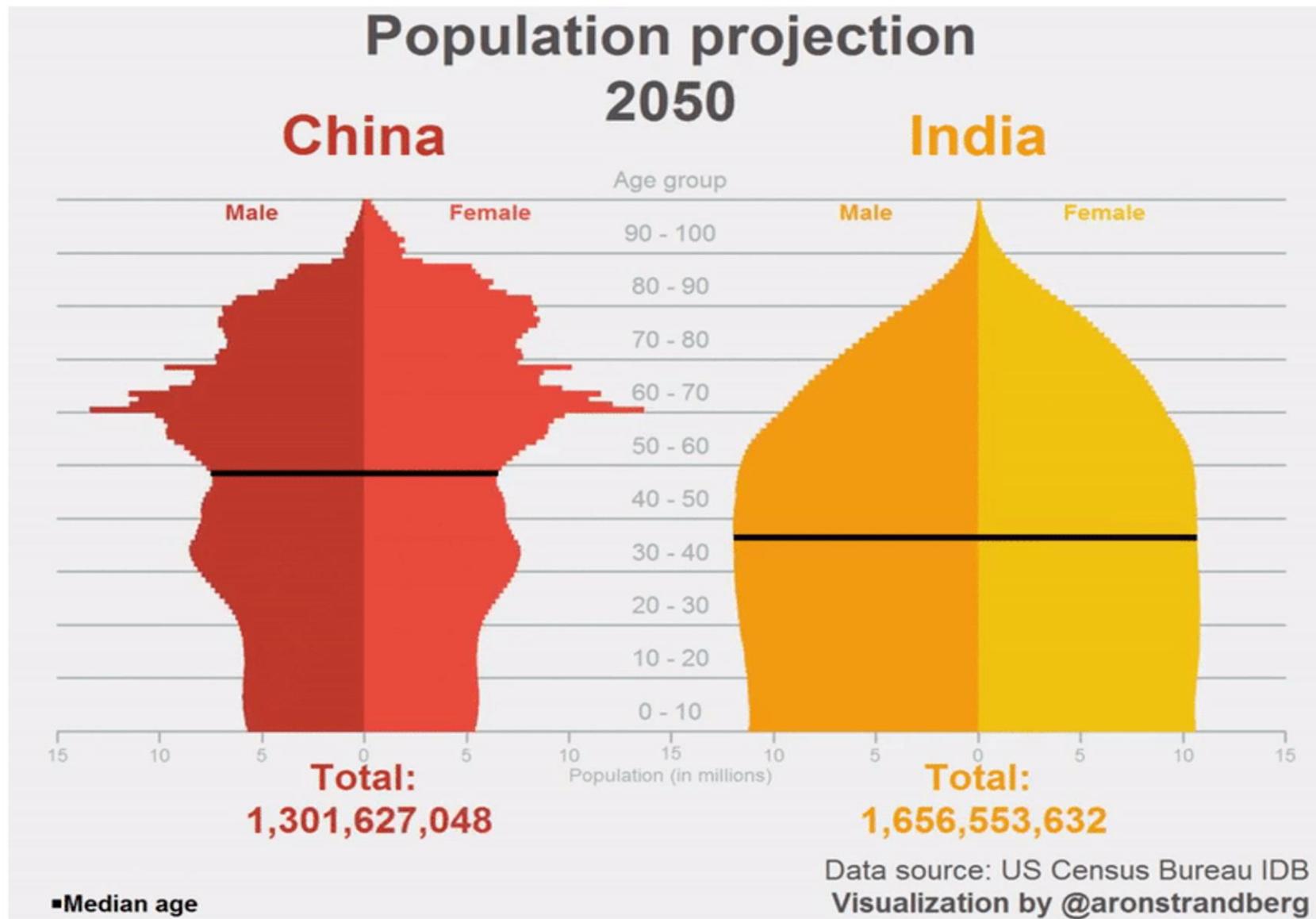


Almost all people, economic activities, and cities exist in only
≈40% of China's land area east to the famous *Hu Huanyong* line

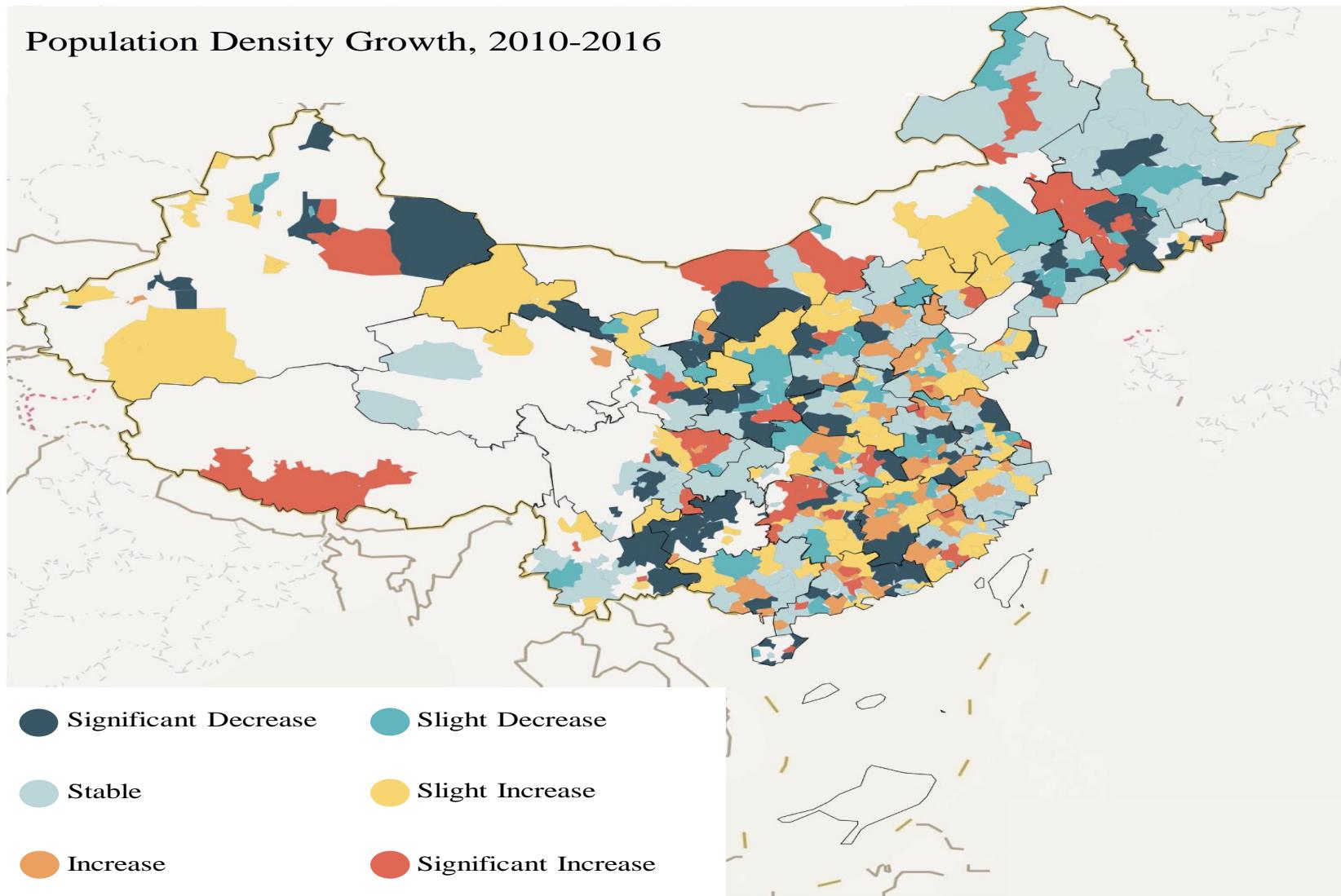
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The Population Limit 1: Aging

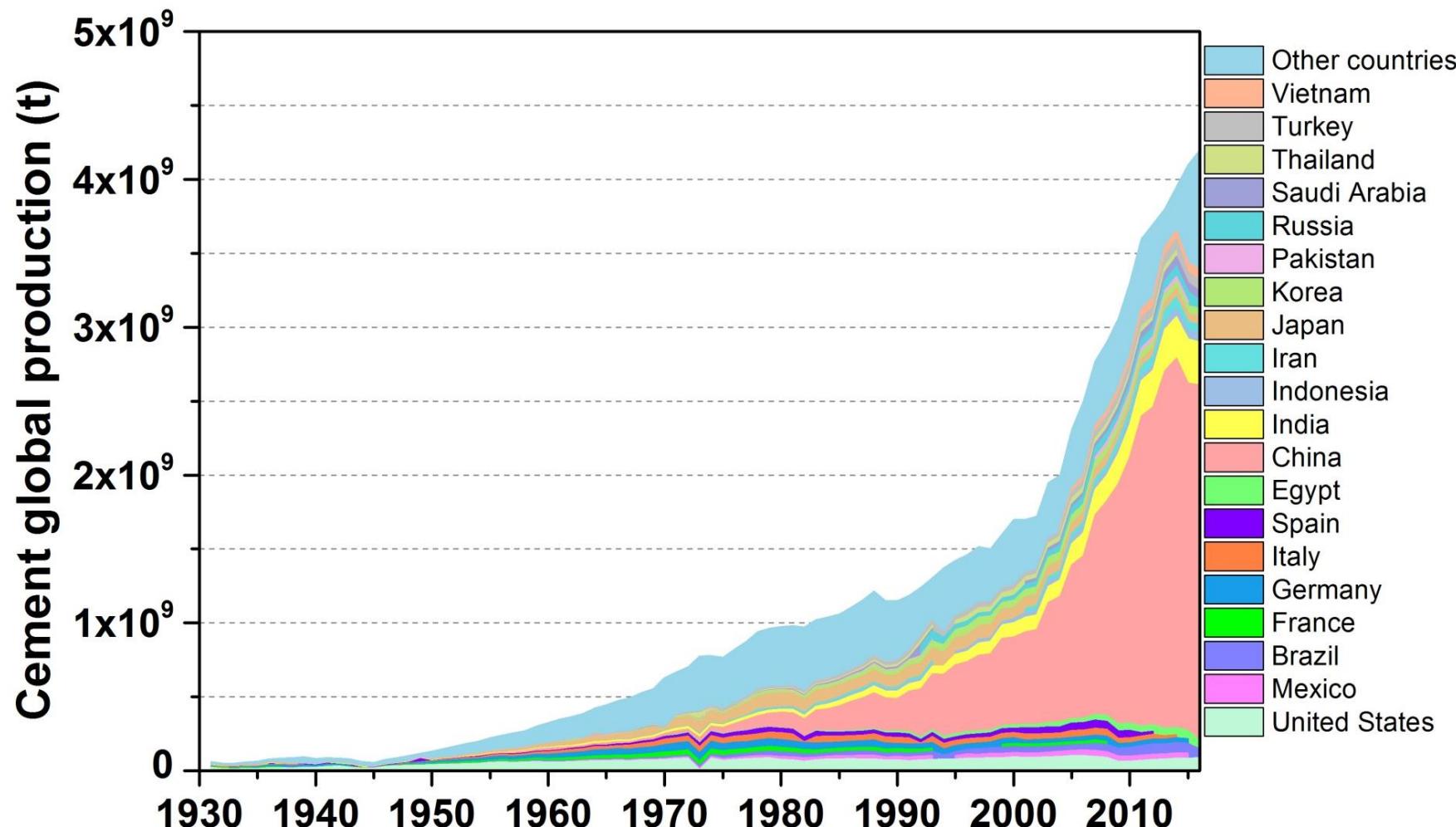


The Population Limit 2: Regional Population Loss



The Resources-Environmental Limit

China is producing over 50% of global cement, iron, aluminum...



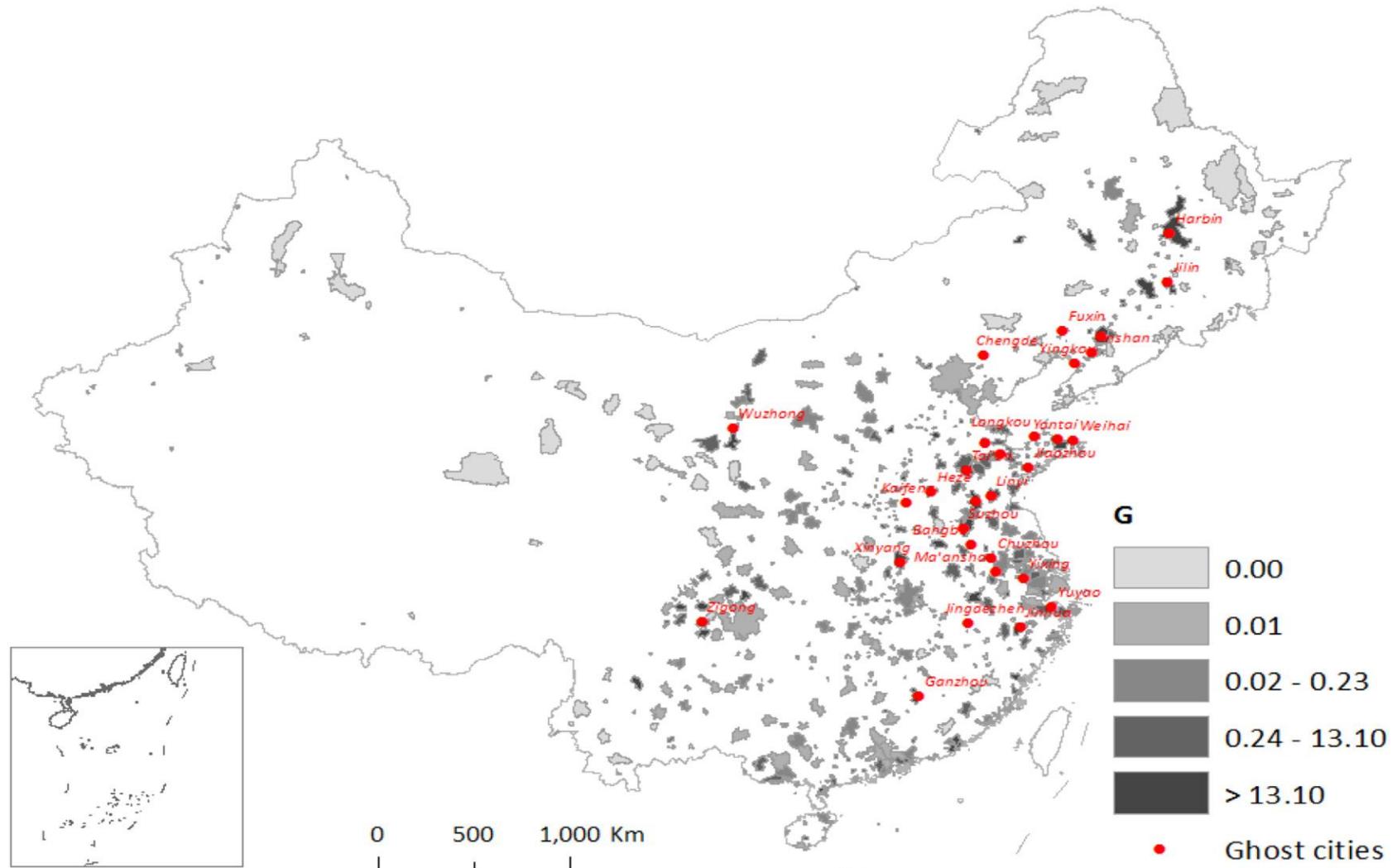
The negative lock-in effects

The growth in the last 3-4 decades have resulted in significant Negative Lock-In Effects that have to be addressed in the coming decades

Locked-In 1: Over/Unnecessary Expansion of Urban Land Use



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Locked-In 2: Inappropriate Design of Infrastructure

Urban surfaces are over cemented, resulting in flooding and the break of biogeochemical cycles in urban and peri-urban areas!

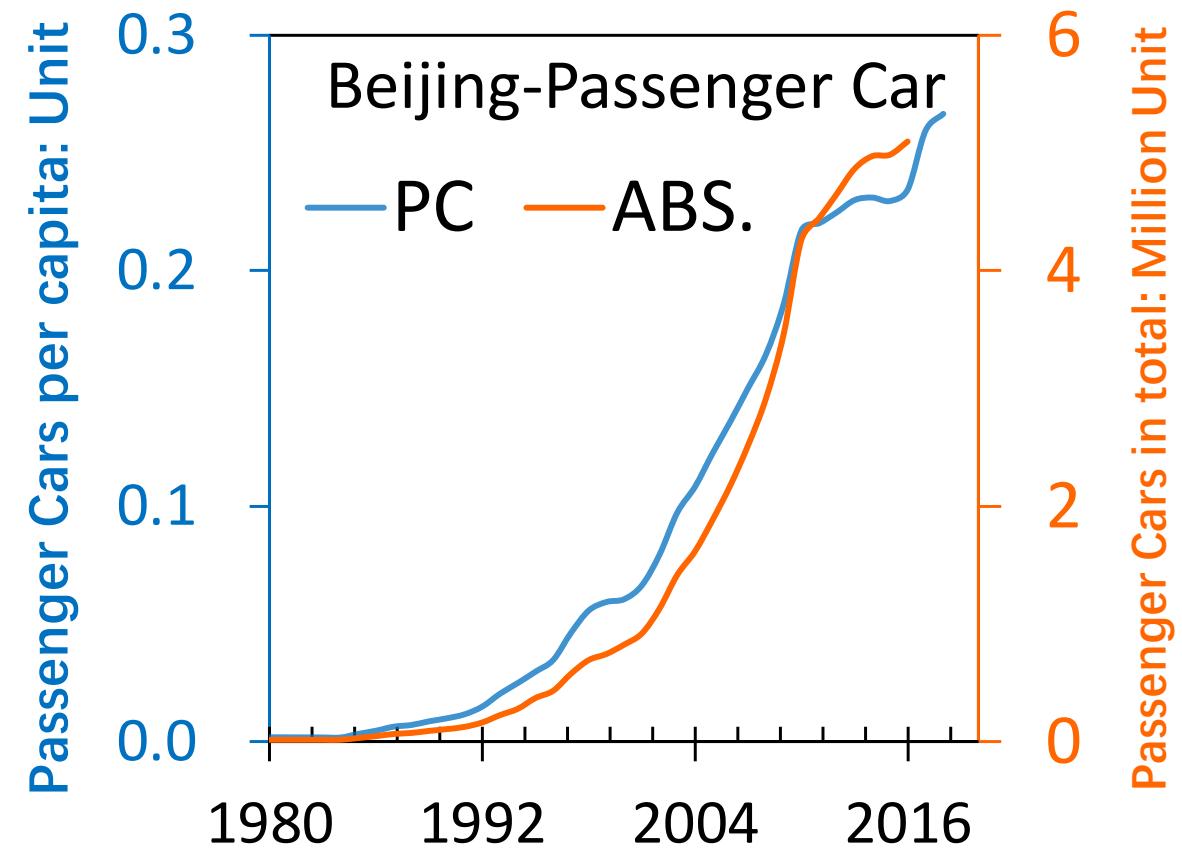


Locked-In 3: The Improper Choice of Transportation Systems

Pursue for Cars + High Density + Lack of Parking Space



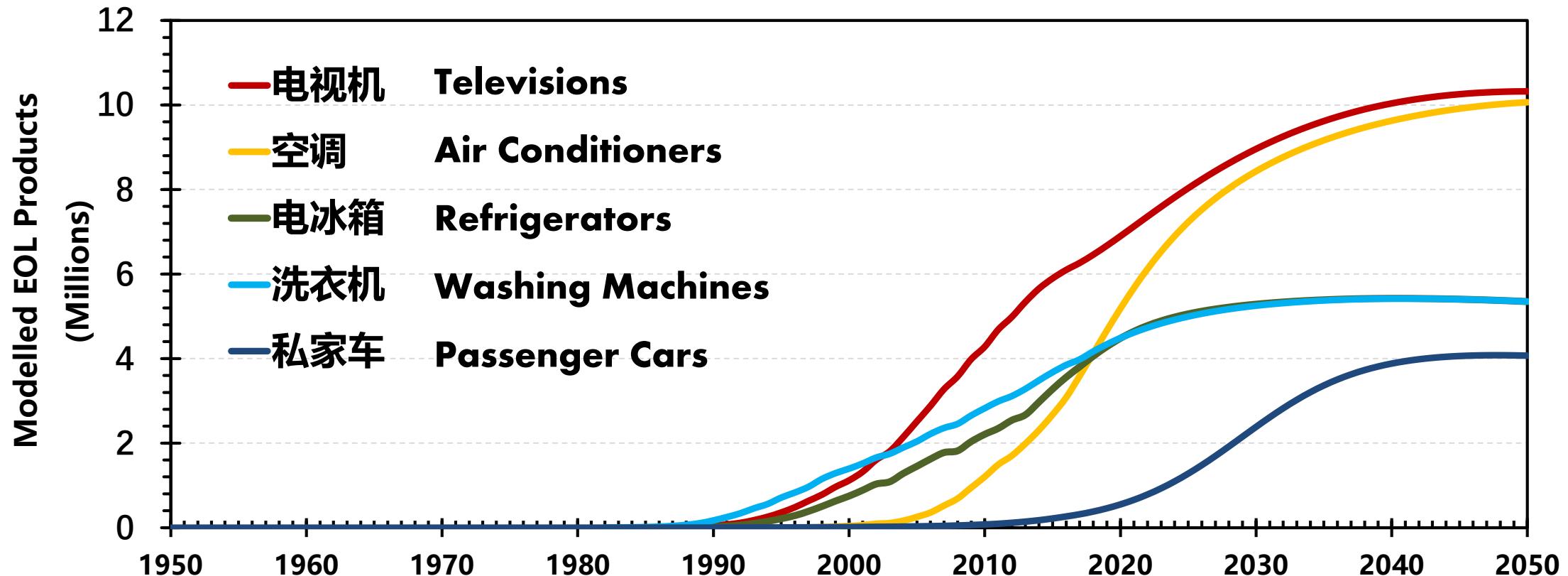
http://photos.caixin.com/2011-11-21/100329566_2.html



The emerging health challenges

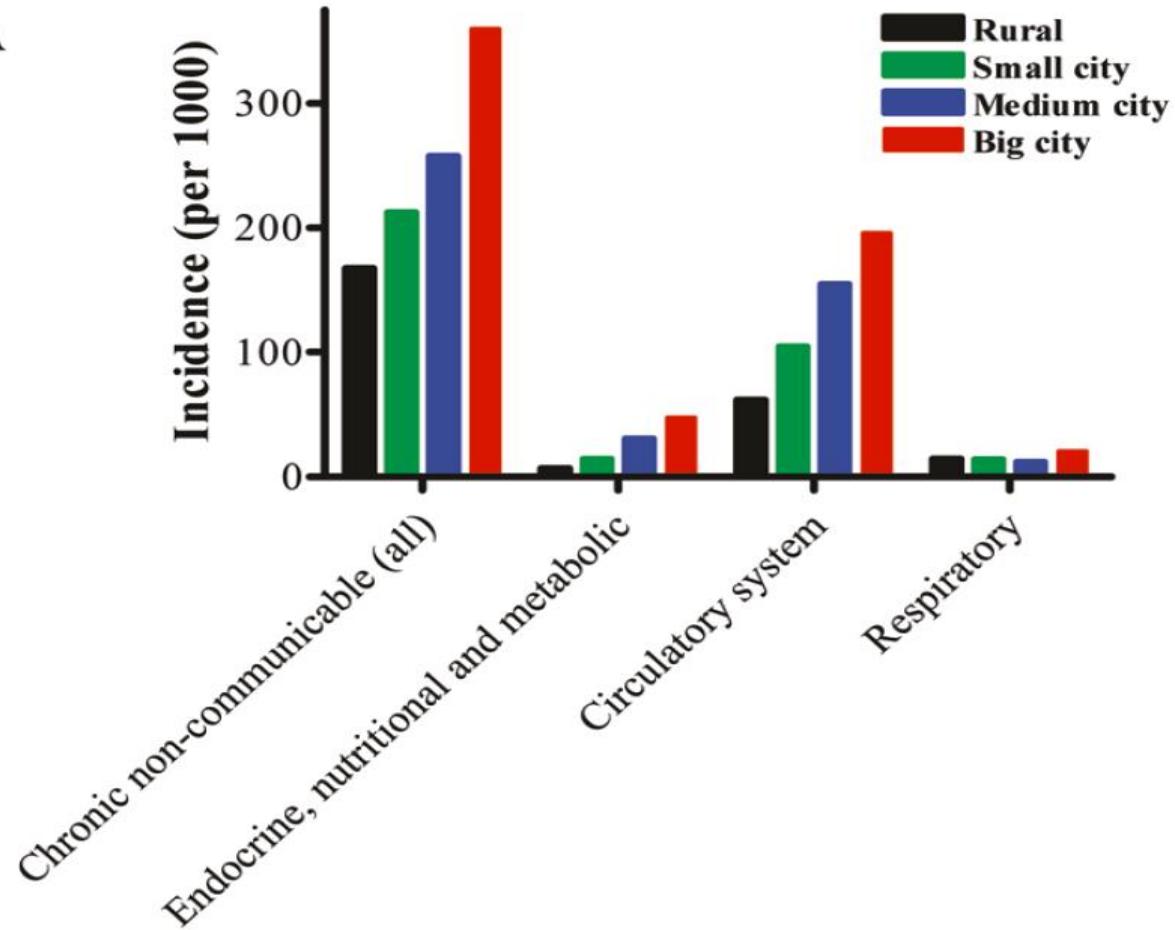
New challenges to health of both cities themselves and people living in cities are emerging because cities have reached an unprecedented scale and brought new lifeways

New Challenge 1: The Coming Surge of Solid Wastes

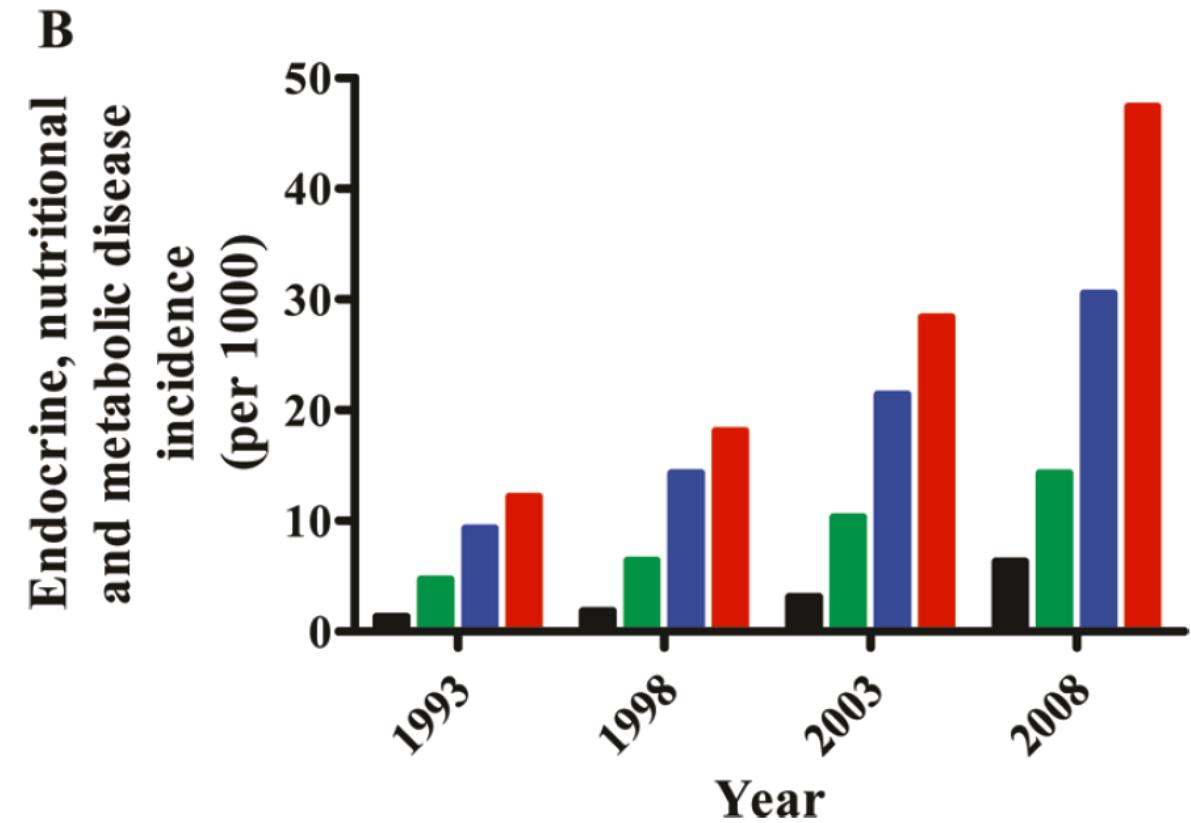


New Challenge 2: High-Calorie Diets, Less Physical Activity...

A



B



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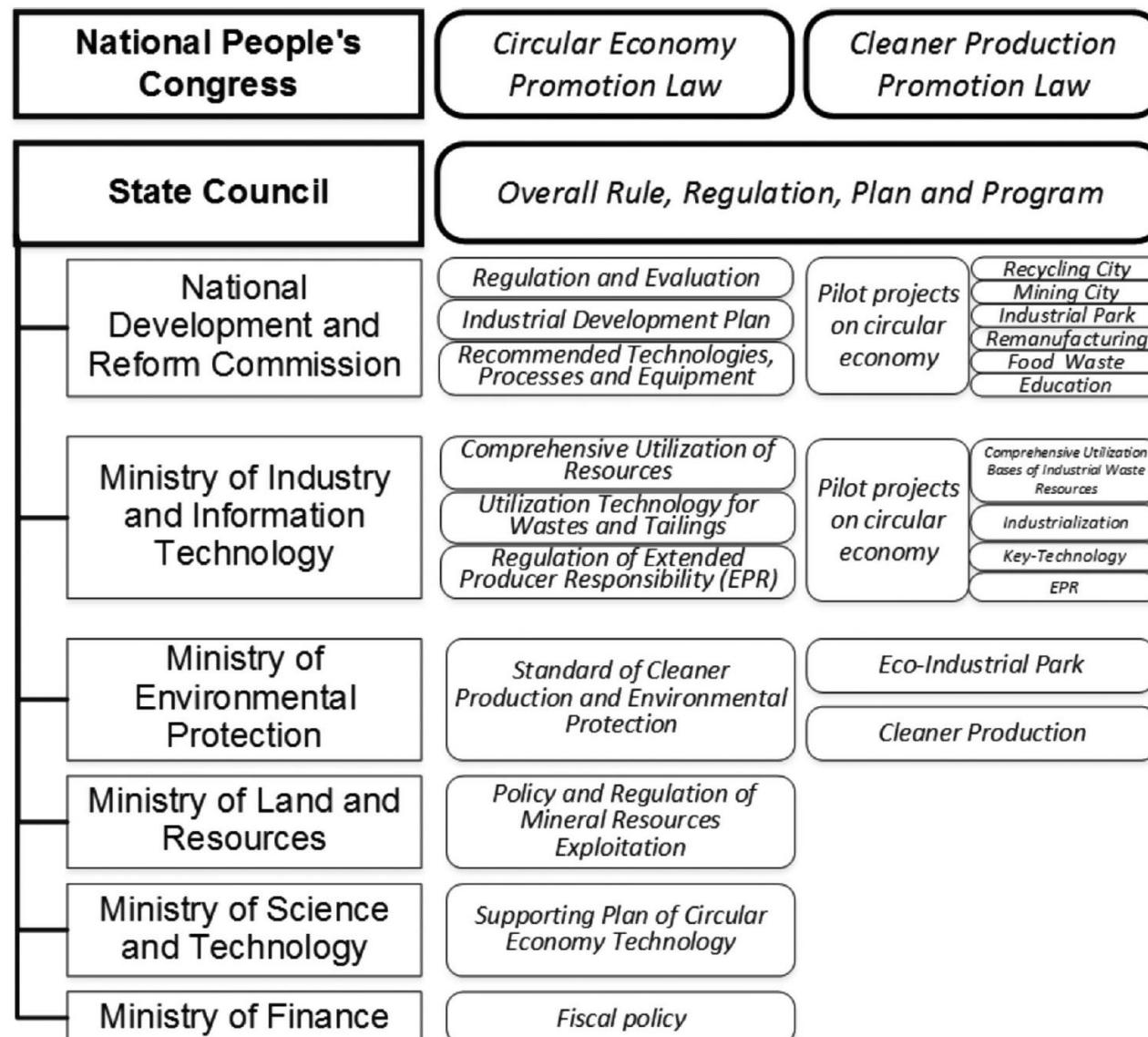
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Typical Efforts for Addressing Challenges: “XXXX City”

Each Ministry has its incentive to build “XXXX City”

Time	XXXX City	The Challenges to Address	The Leading Ministry
1990	Sanitary City	Environmental and health issues	National Health Commission
1997	Envtl. Prot. Model City	Environmental issues	Ecology and Environment Ministry
2000	Garden City	Landscape and livability	Housing and Construction Ministry
2004	Forestry City	Ecosystem and livability	Forestry Agency
2008	Low-Carbon City	Carbon mitigation	Development and Reform Commission
2010	Circular Economy City	Resources efficiencies and wastes	Development and Reform Commission
2012	Smart City	The application of IOTs and Its in urban management	Housing and Construction Ministry Science and Technology Ministry
2017	Resilient City	Adaptation of disasters	Emergency Management Ministry
2017	Sponge City	Urban flooding	Housing and Construction Ministry
2019	Zero-Waste City	Solid wastes management	Ecology and Environment Ministry

The Joint Efforts to Promoting Circular Economy in China



Source: Zhu et al, Journal of Industrial Ecology. 2018.

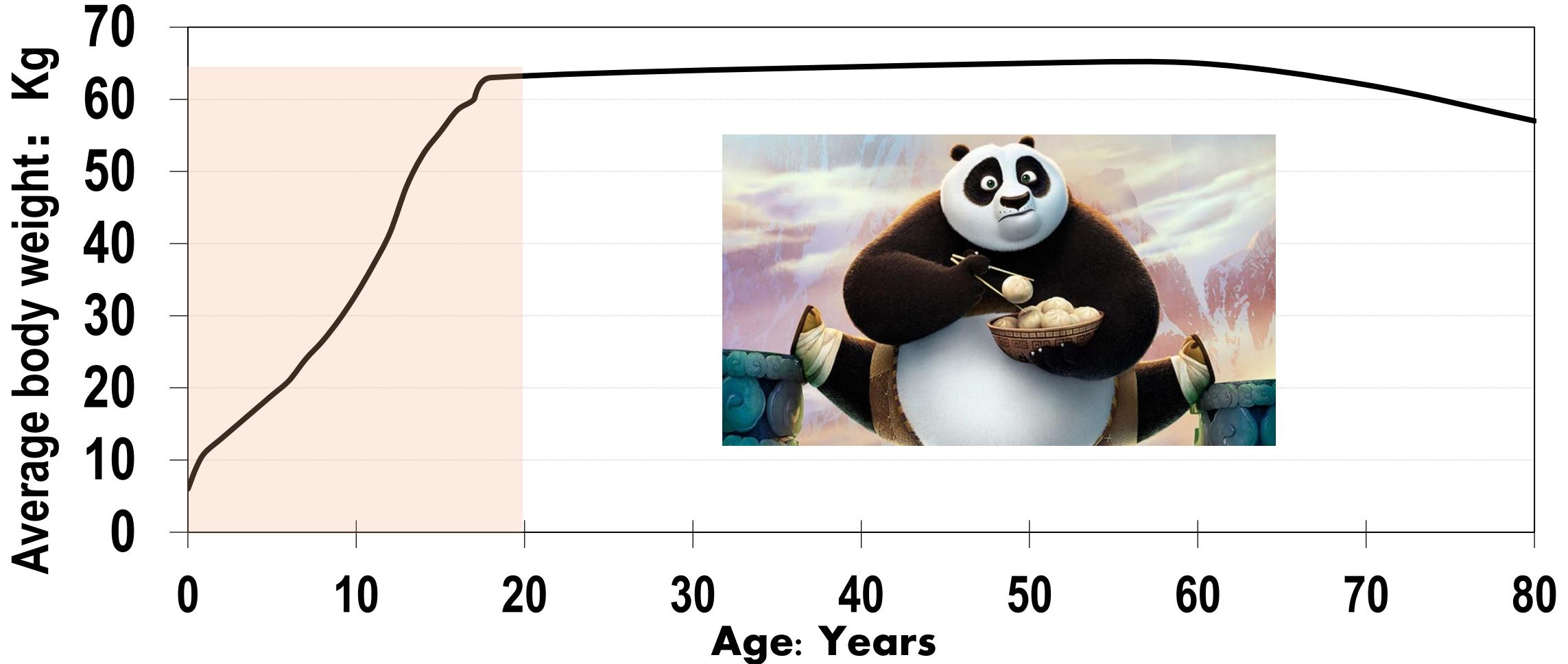
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Summary and Implications

1. China's solution to the lack of urbanization during 1978-2010s was **GROWTH**, which has been pretty effective.
2. The growth may be approaching a plateau and has resulted in significant negative lock-in effects.
3. New challenges, especially in **HEALTH**, are emerging with cities growing to unprecedented big scales and bringing new lifestyles to people.

A Plausible Metaphor?



Thanks!

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