



**中国科学院城市环境研究所**  
Institute of Urban Environment, Chinese Academy of Sciences

**Advancing Urban Sustainability in China and the United States**

# **From Growth to Health**

# **Urban Sustainability Challenges in China**

**Wei-Qiang Chen**

**Institute of Urban Environment, CAS**

**Dec. 16, 2019 @ Washington, DC**

# Outline

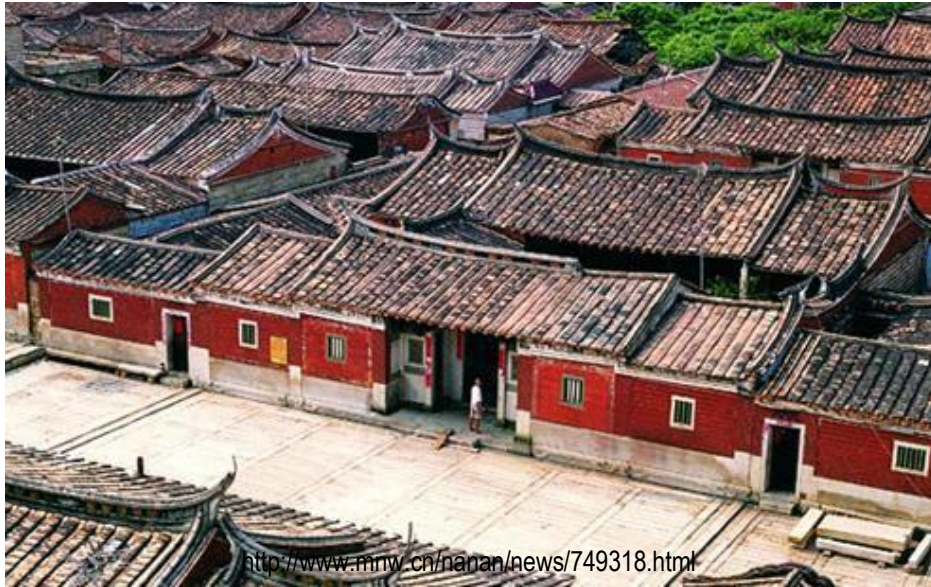
1. **About Me and My Special Experiences**
2. **China's Achievements in Urbanization**
3. **China's Challenges in Urban Sustainability**
  - ① Macroscale limits to growth
  - ② The negative lock-in effects
  - ③ The emerging health challenges
4. **Efforts to Address these Challenges**
5. **Summary and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



Courtesy of Yupeng Liu



Forman & Wu, 2016

**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.



Courtesy of Yupeng Liu



Courtesy of Jinsheng Chen

**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.



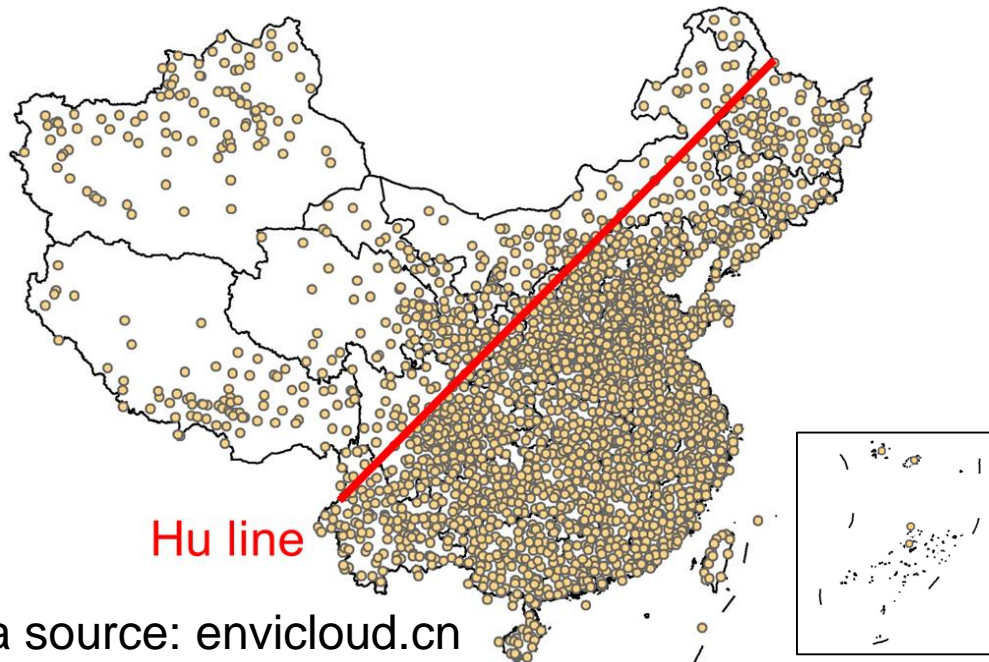
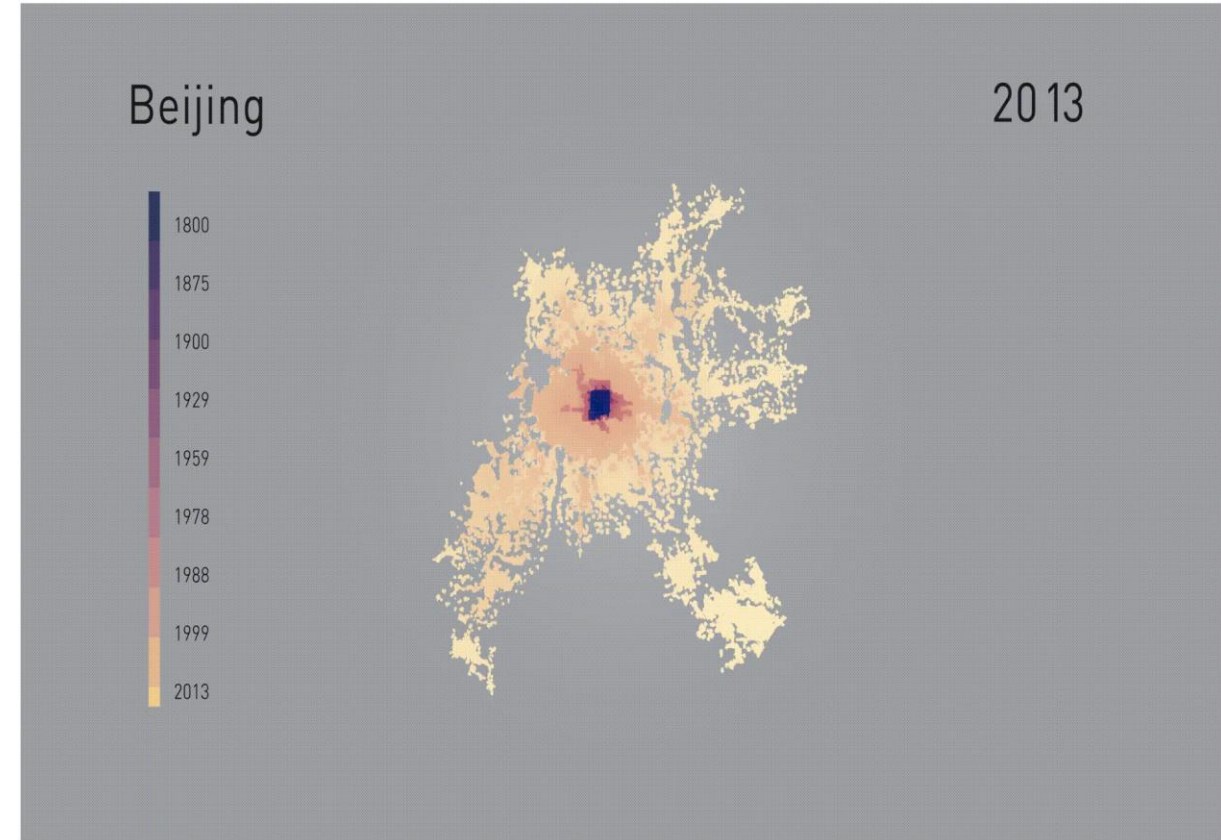
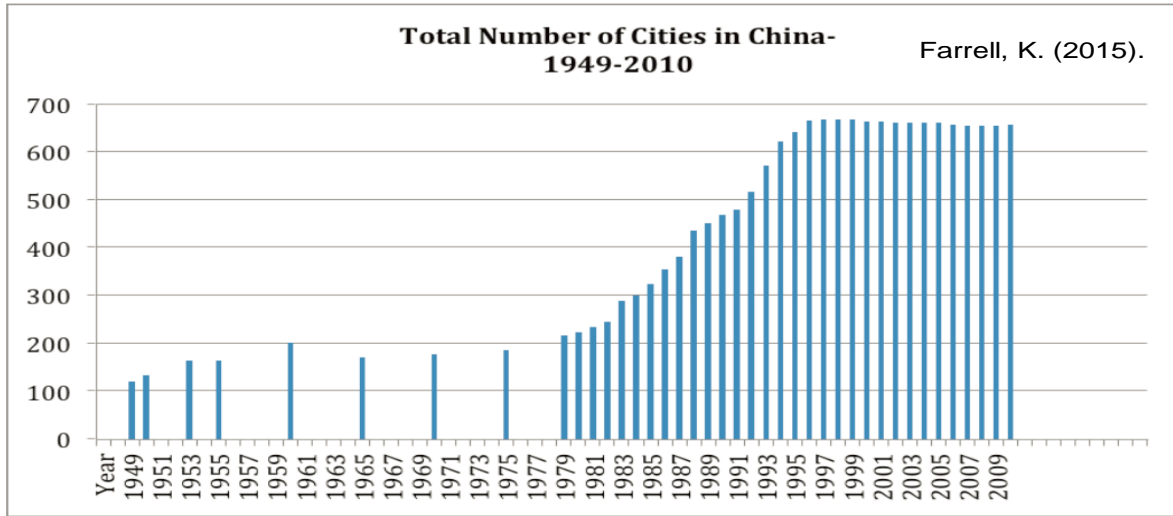
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**1978-2018 was a period when China needed and had growth!**

**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 $\approx 600$ Cities and Significantly Expand them



Data source: envicloud.cn

Source: [atlasofurbanexpansion.org](http://atlasofurbanexpansion.org)



# Equip and Connect Cities with Modern Infrastructure

## Public Transportation in Xiamen

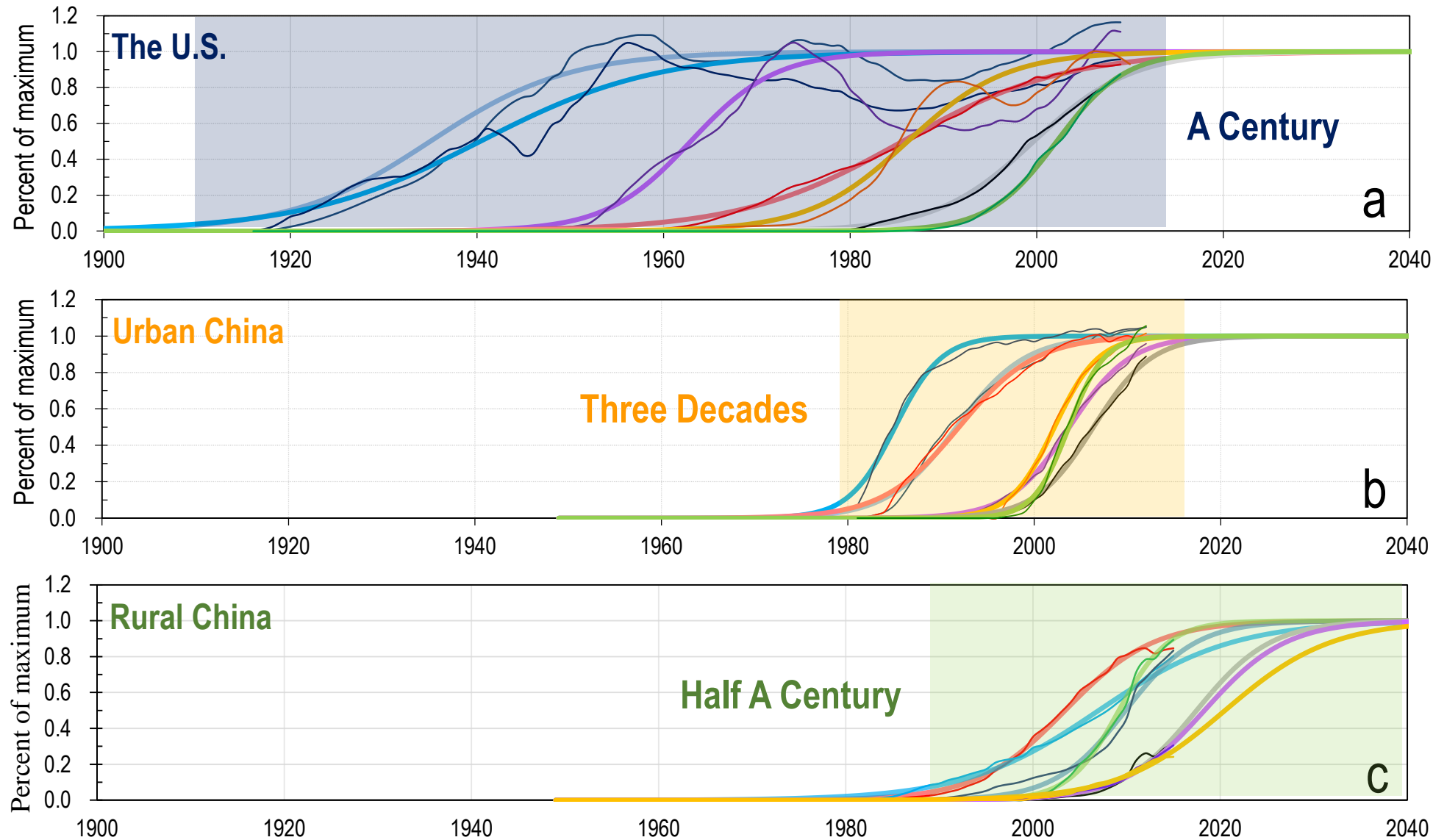


## High-Speed Railway System



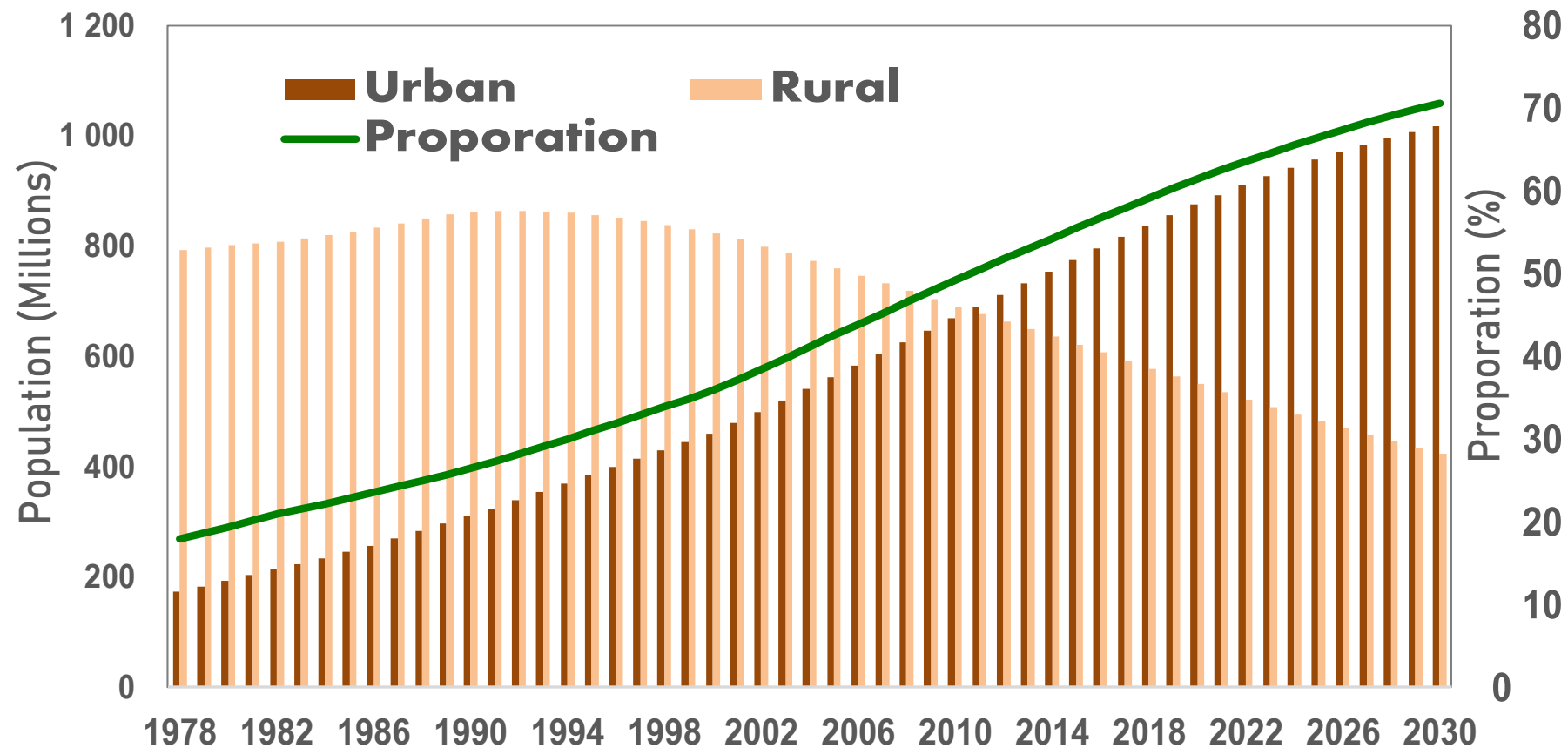
Source: Xu and Huang, Transportation Research Part A, 2019

# 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%



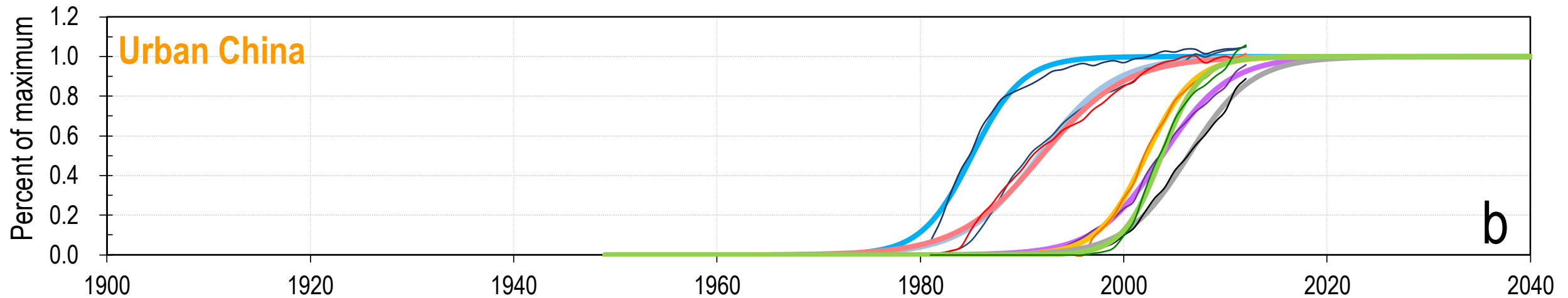


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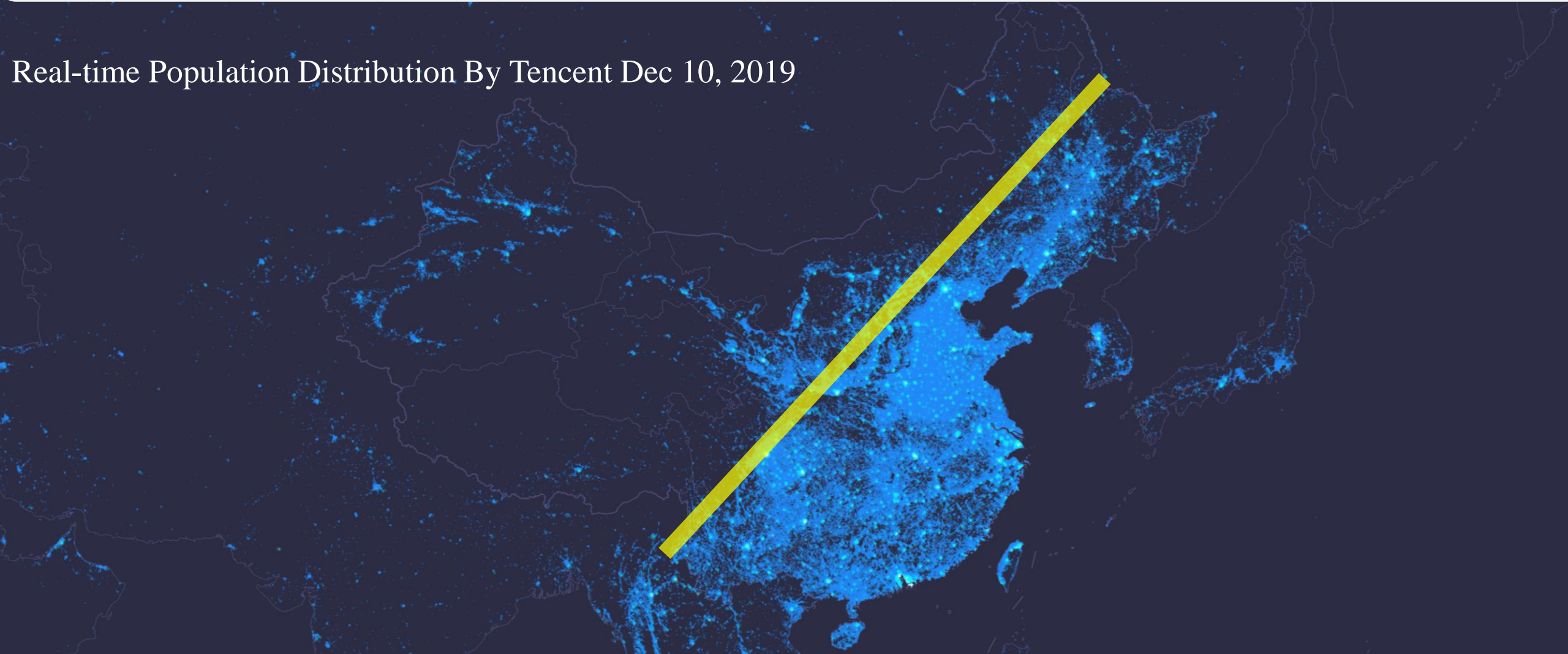
## Macroscale limits to growth

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



# The Ecological-Geographical Limit: Hu-Huanyong Line

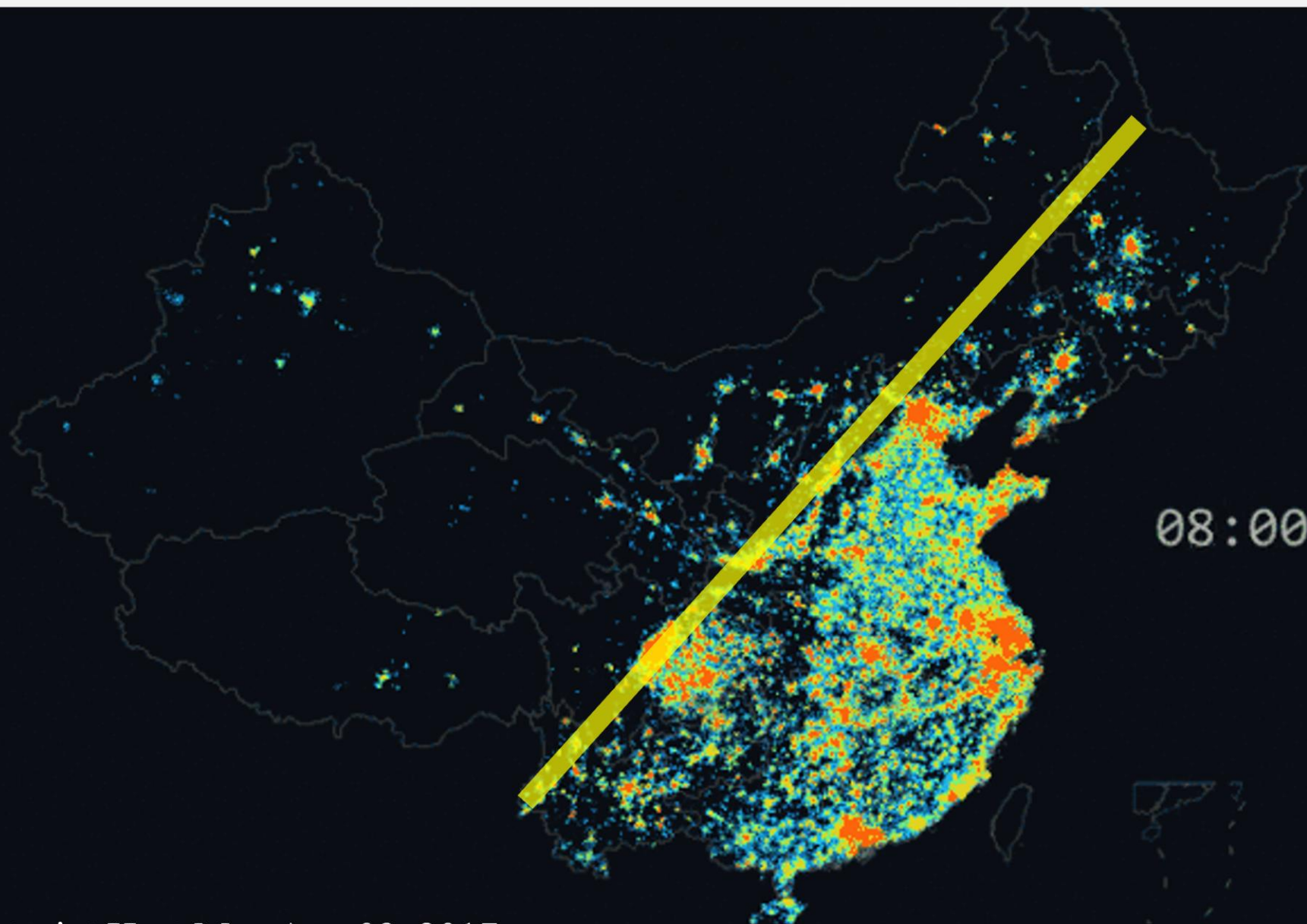
Real-time Population Distribution By Tencent Dec 10, 2019



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



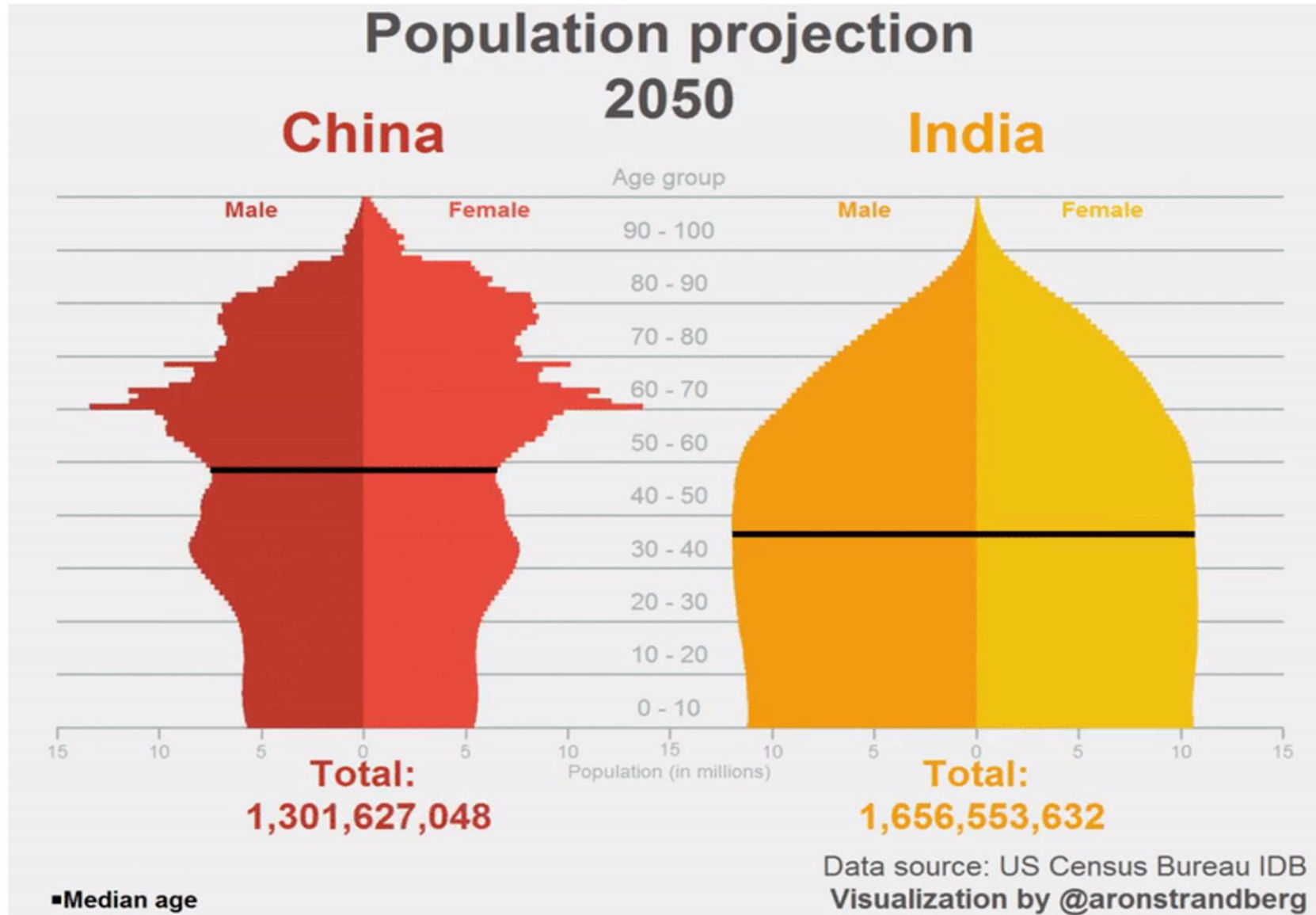
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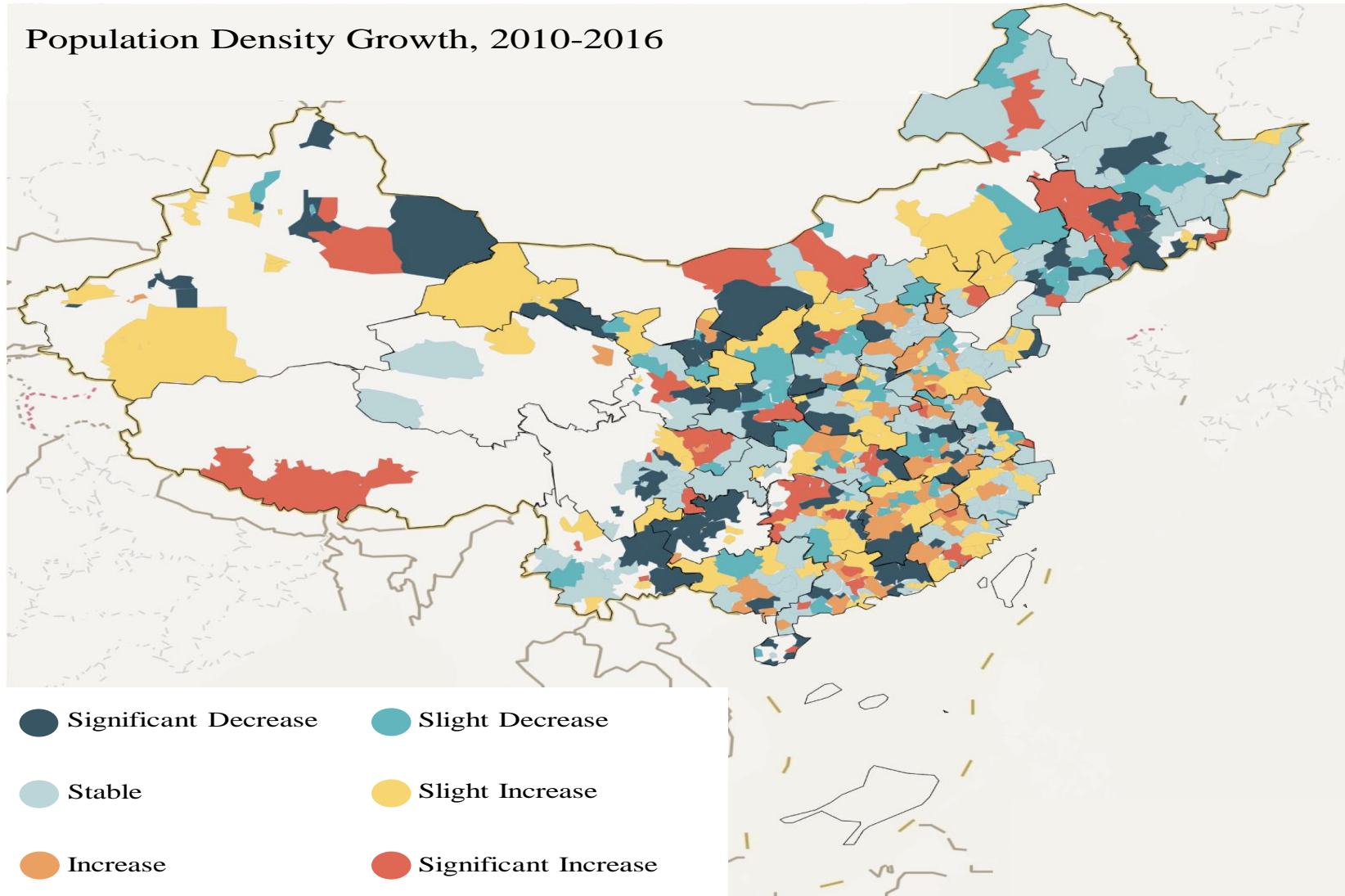
DiDi 24-hour Footprint Heat Map Aug 09, 2017

Source: Didi Global

# The Population Limit 1: Aging



# The Population Limit 2: Regional Population Loss

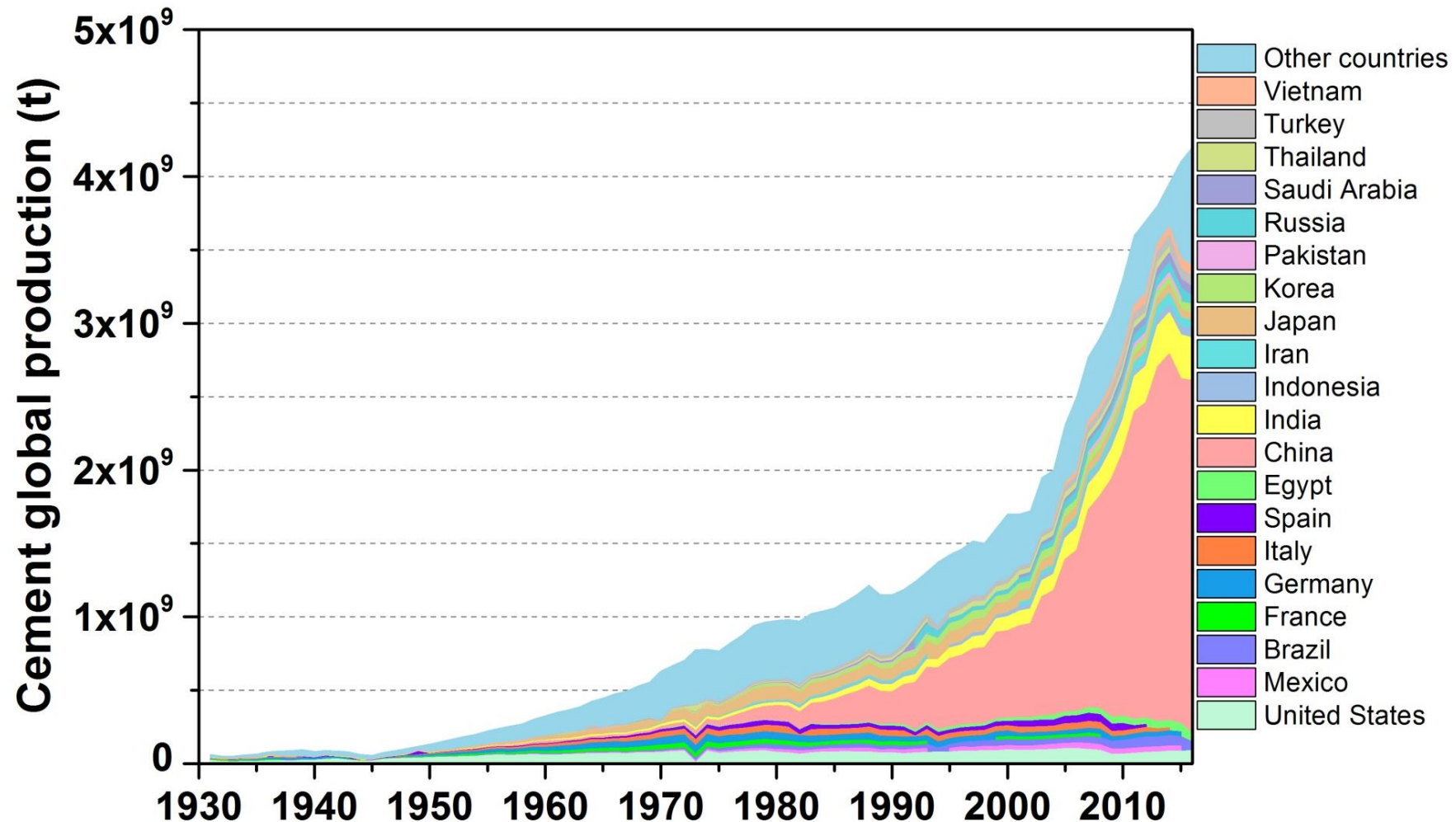


Data Source: China Urban Construction Statistical Yearbook, 2010-2016 & Netease



# The Resources-Environmental Limit

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



## The negative lock-in effects

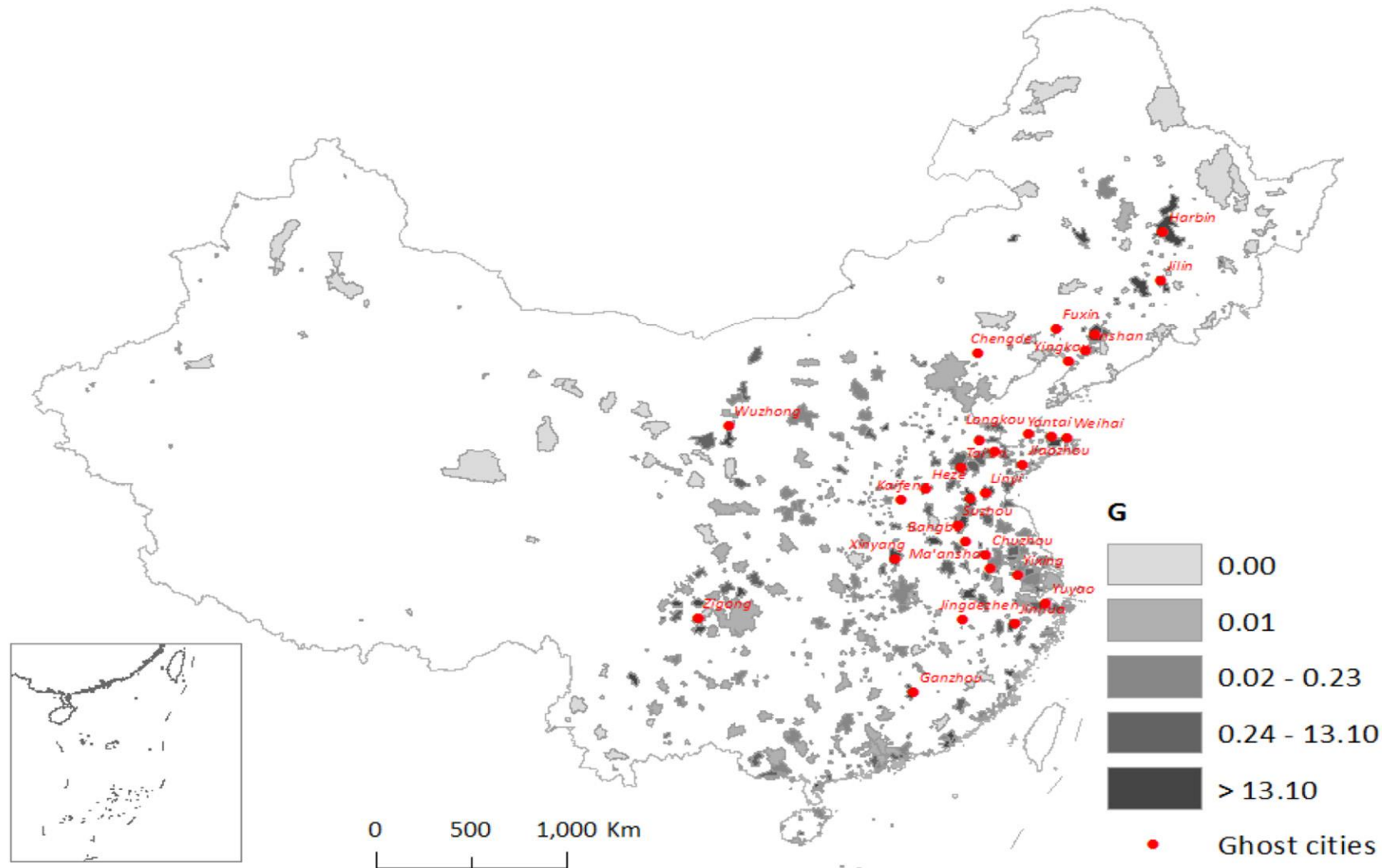
The growth in the last 3-4 decades have resulted in  
significant Negative Lock-In Effects  
that have to be addressed in the coming decades

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





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



## 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!



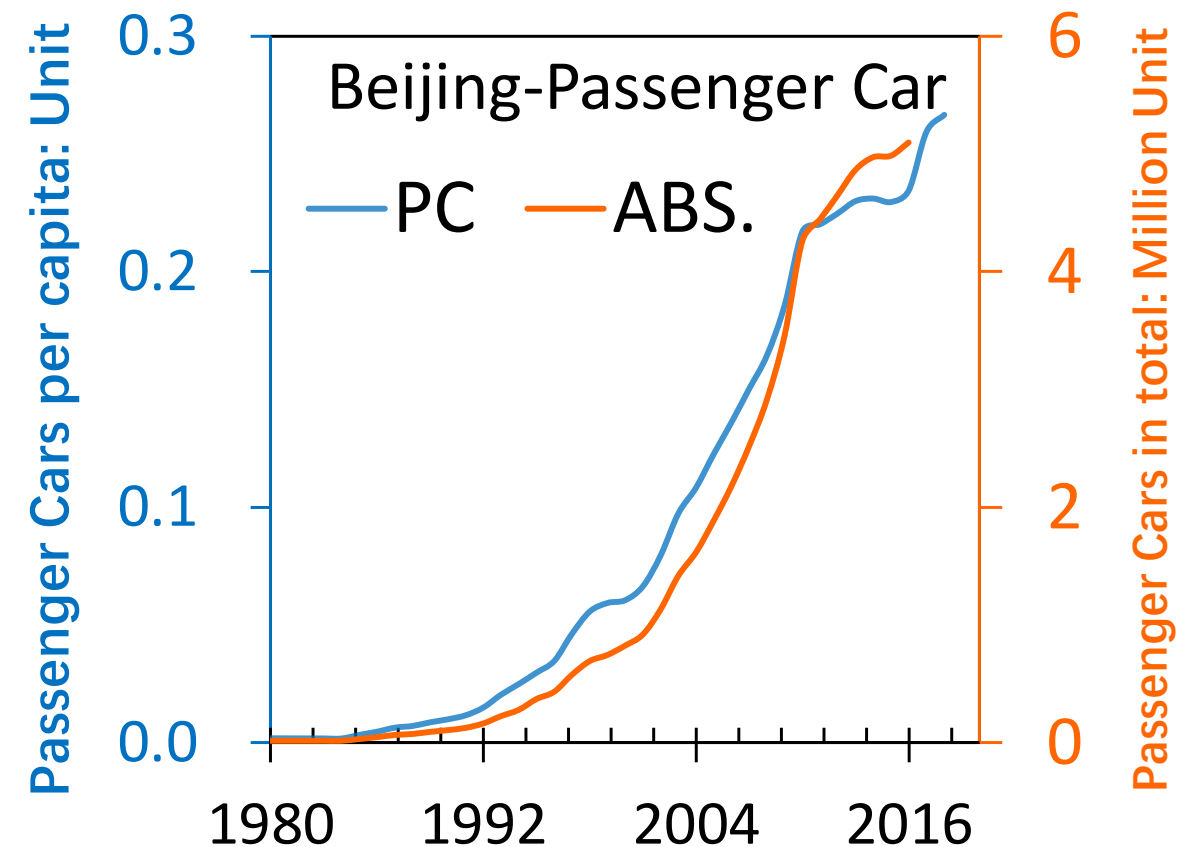


# Locked-In 3: The Improper Choice of Transportation Systems

Pursue for Cars + High Density + Lack of Parking Space



[http://photos.caixin.com/2011-11-21/100329566\\_2.html](http://photos.caixin.com/2011-11-21/100329566_2.html)

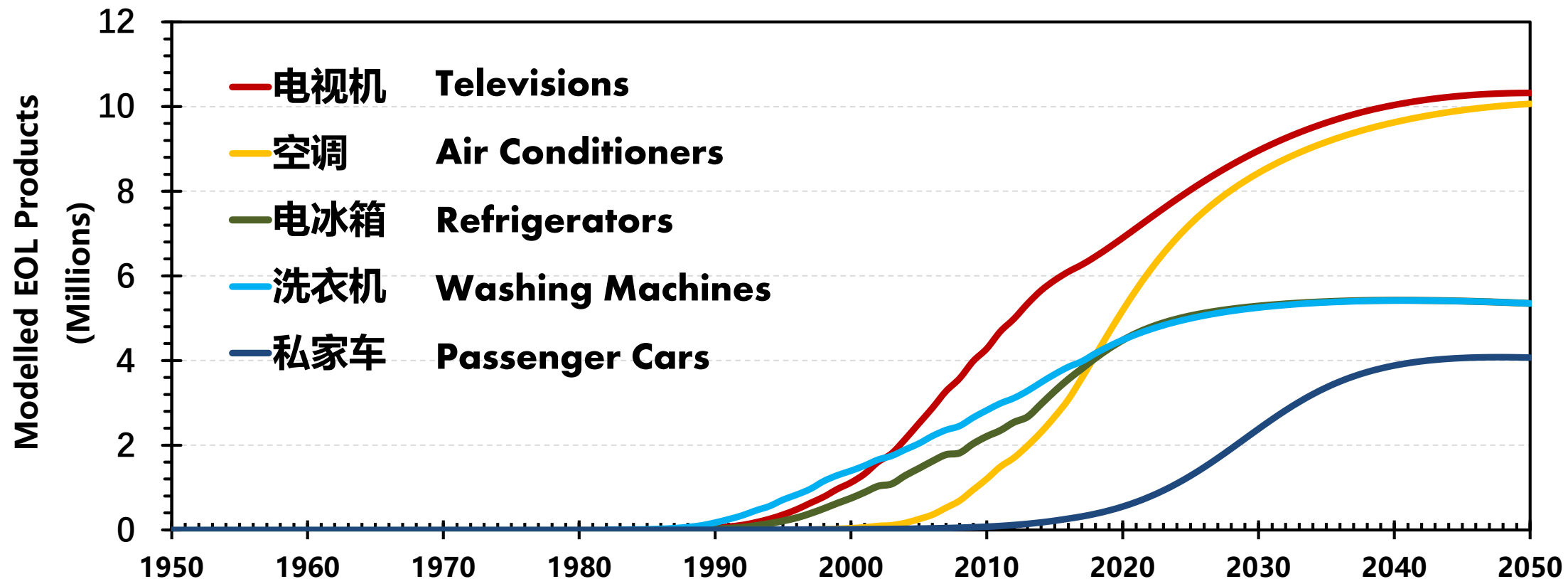




## The emerging health challenges

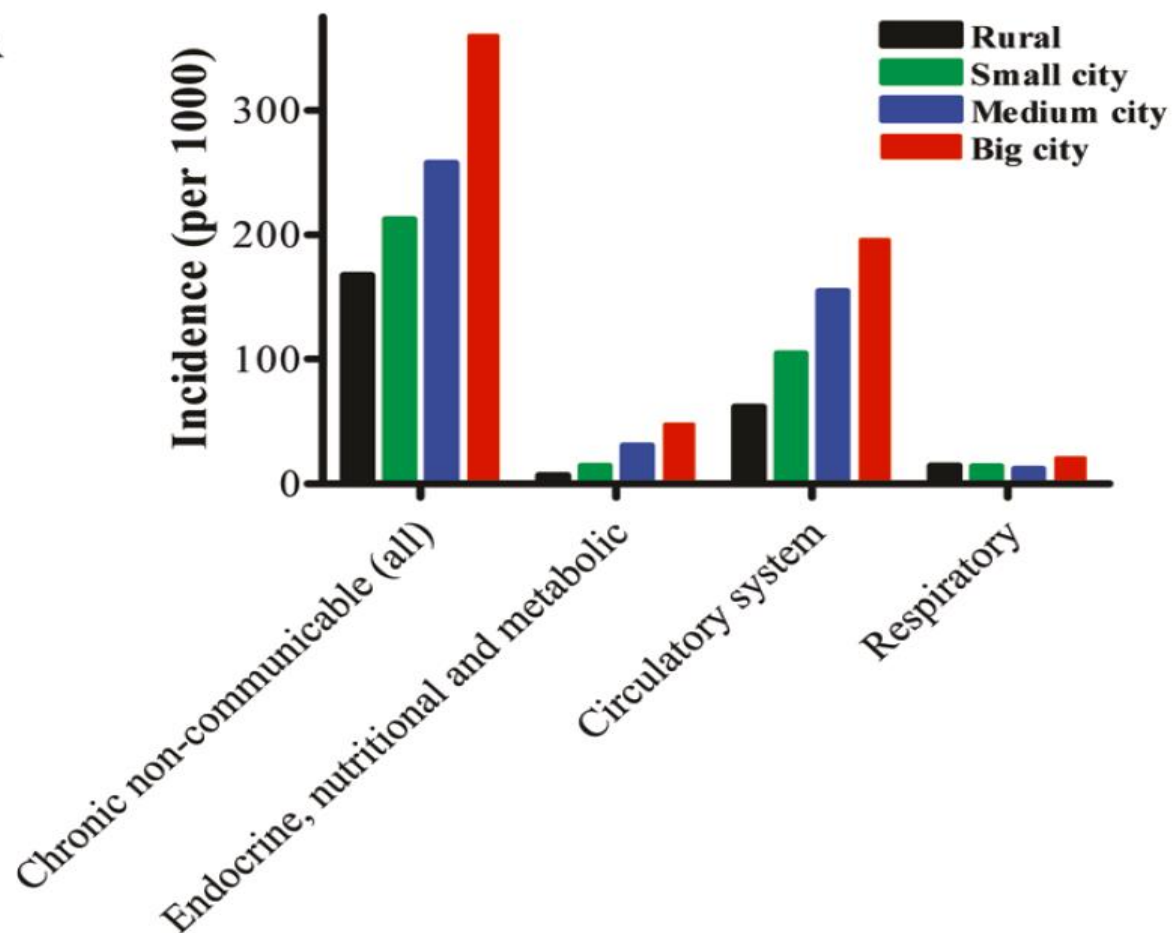
New challenges to health of both cities themselves and people living in cities are emerging because cities have reached an unprecedented scale and brought new lifeways

# New Challenge 1: The Coming Surge of Solid Wastes

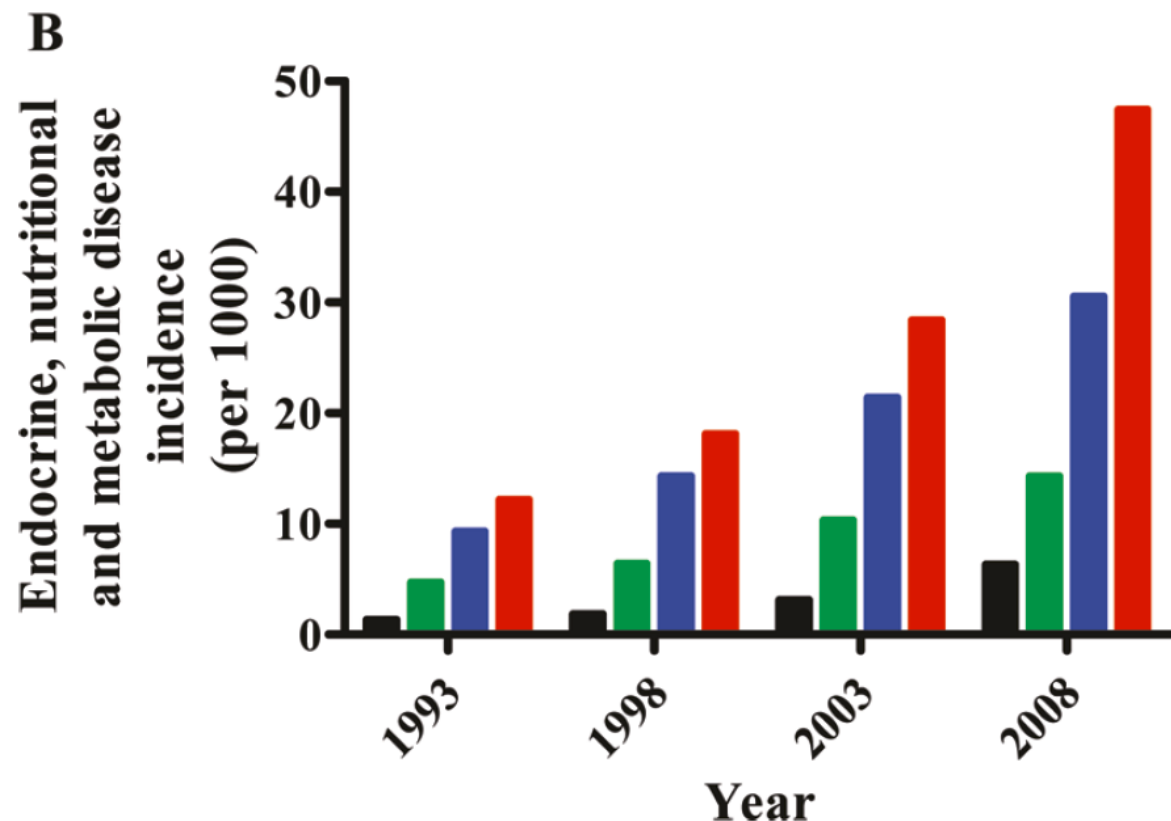


## New Challenge 2: High-Calorie Diets, Less Physical Activity...

A



B





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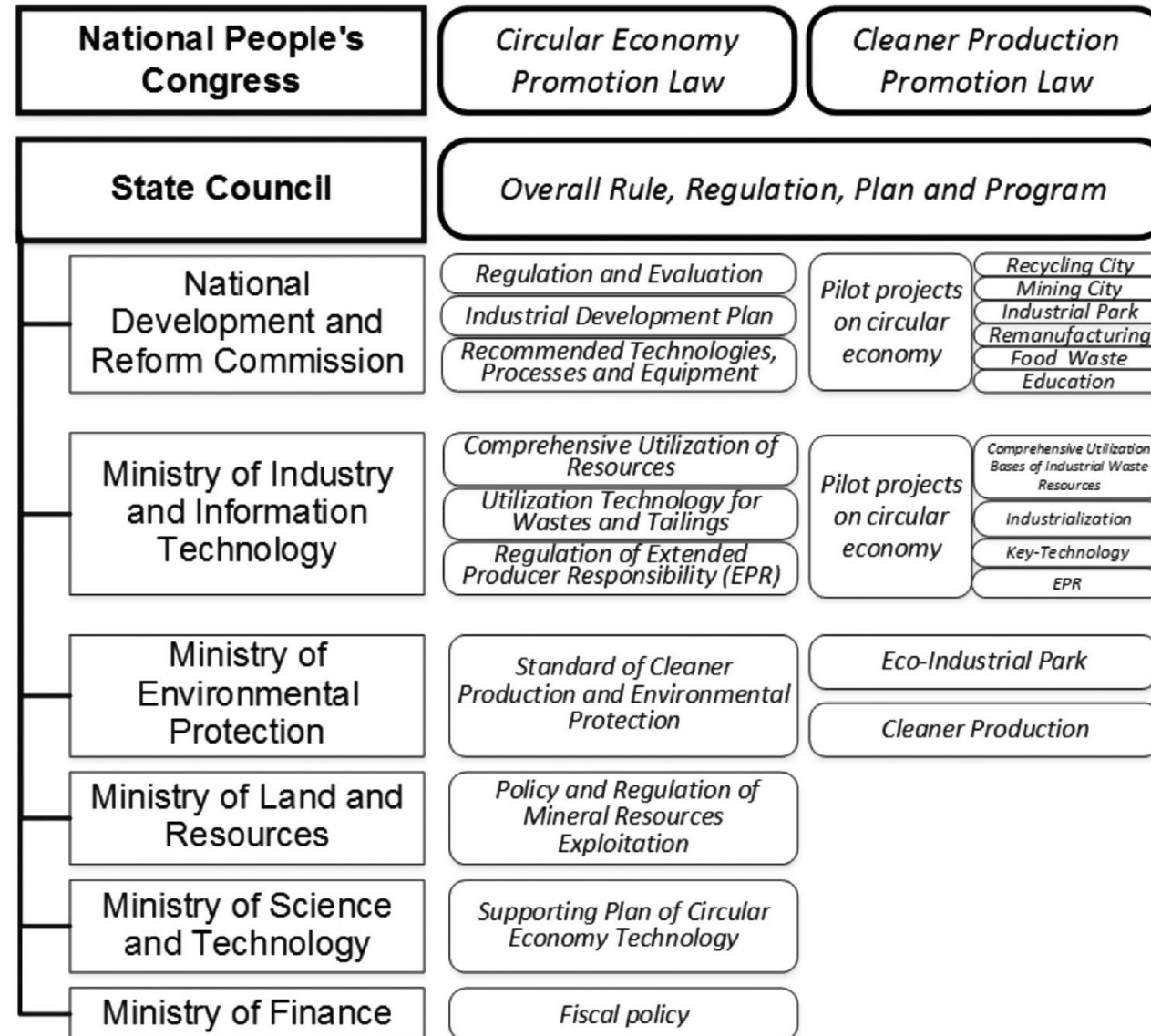
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# Typical Efforts for Addressing Challenges: “XXXX City”

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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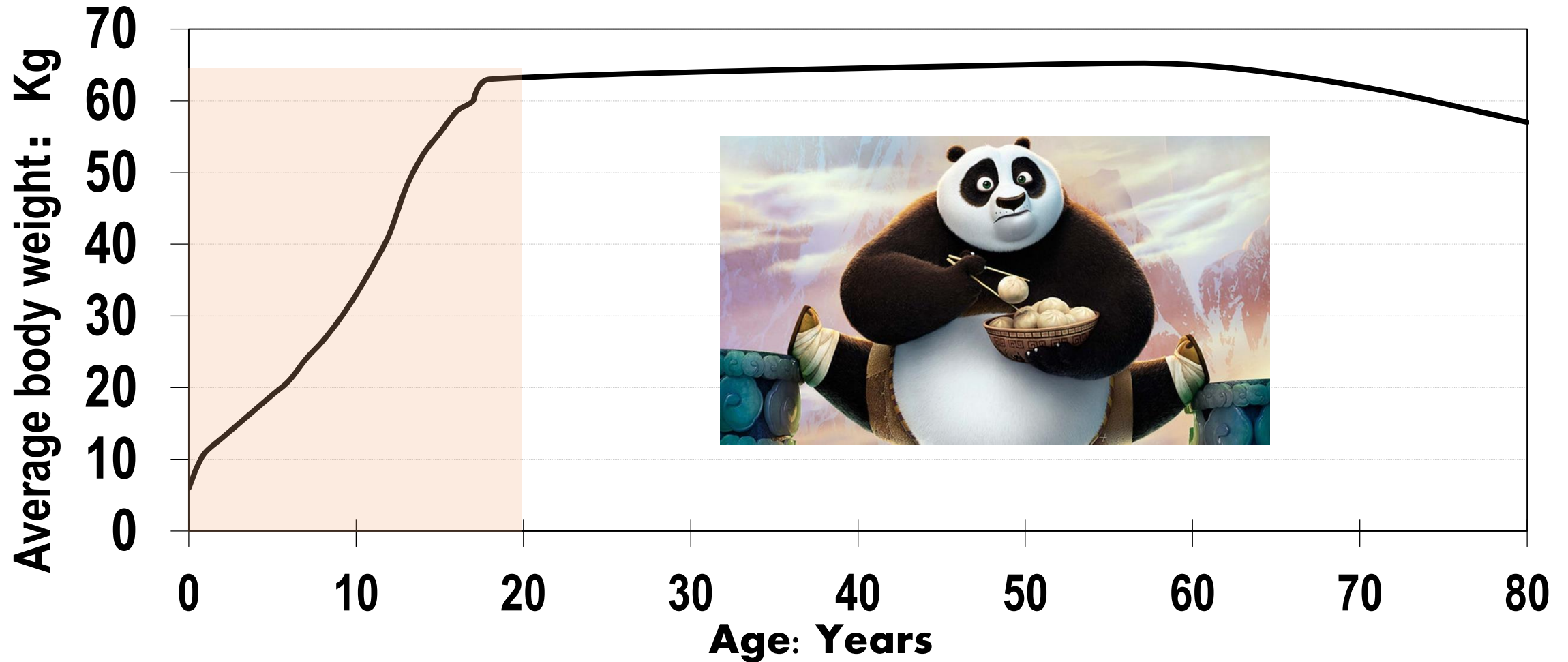
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# Summary and Implications

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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Group: <http://wqchen.org> Urban Data Platform: <http://uree.org>

