URBAN SUSTAINABILITY & URBAN METABOLISM

Ruichang Mao
Ph.D. candidates,
rma@kbm.sdu.dk

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WHAT IS THE FIRST IMPRESSION OF A CITY IN YOUR MIND?

Skyscrapers, crowded traffic…

Lots of materials and energy…

Home, office, daily life…

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Urban Sustainability

City designed for and used in compliance with sustainable development (SD) definition: "meet the needs of the present generation without compromising the ability of future generations to experience the same." (Brundtland report, 1987)

General Goals

Minimization of

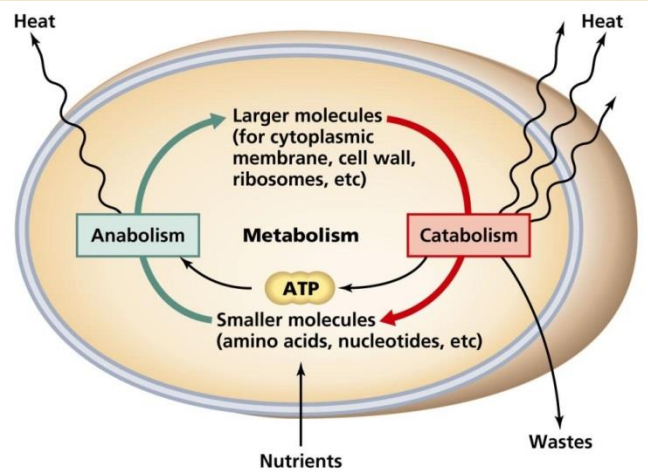
- required **inputs** of resources e.g. water, materials, food, energy
- **outputs** of greenhouse gas (CO_2, CH_4…), solid waste, pollution

while maintaining/improving social and economic development.

"Hot" Topic!

United Nations Sustainable Development Goal #11: Sustainable cities and communities
(…) Making cities safe and sustainable means ensuring access to safe and affordable housing, and upgrading slum settlements. It also involves investment in public transport, creating green public spaces, and improving urban planning and management in a way that is both participatory and inclusive.

URBAN METABOLISM: DEFINITION

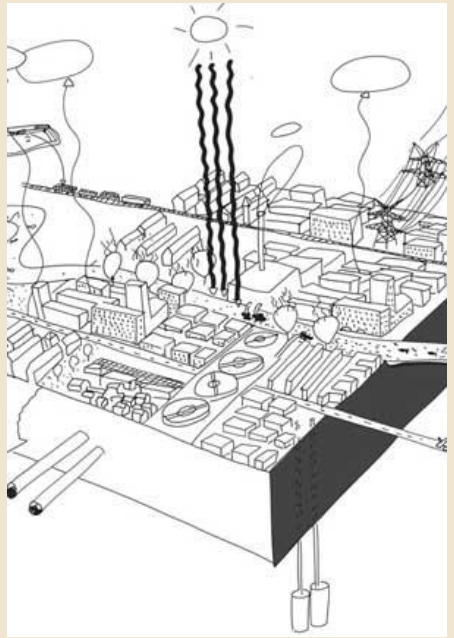


Metabolism is a term that is used to describe all chemical reactions involved in maintaining the living state of the cells and the organism.

→ **Urban metabolism (UM), as an analogy,** regards cities as biological organisms: that cities receive resource flows and reject pollution flows in order to function.

"UM is the sum total of the technical and socioeconomic processes that occur in cities, resulting in growth, production of energy, and elimination of waste."

Kennedy et al., 2007



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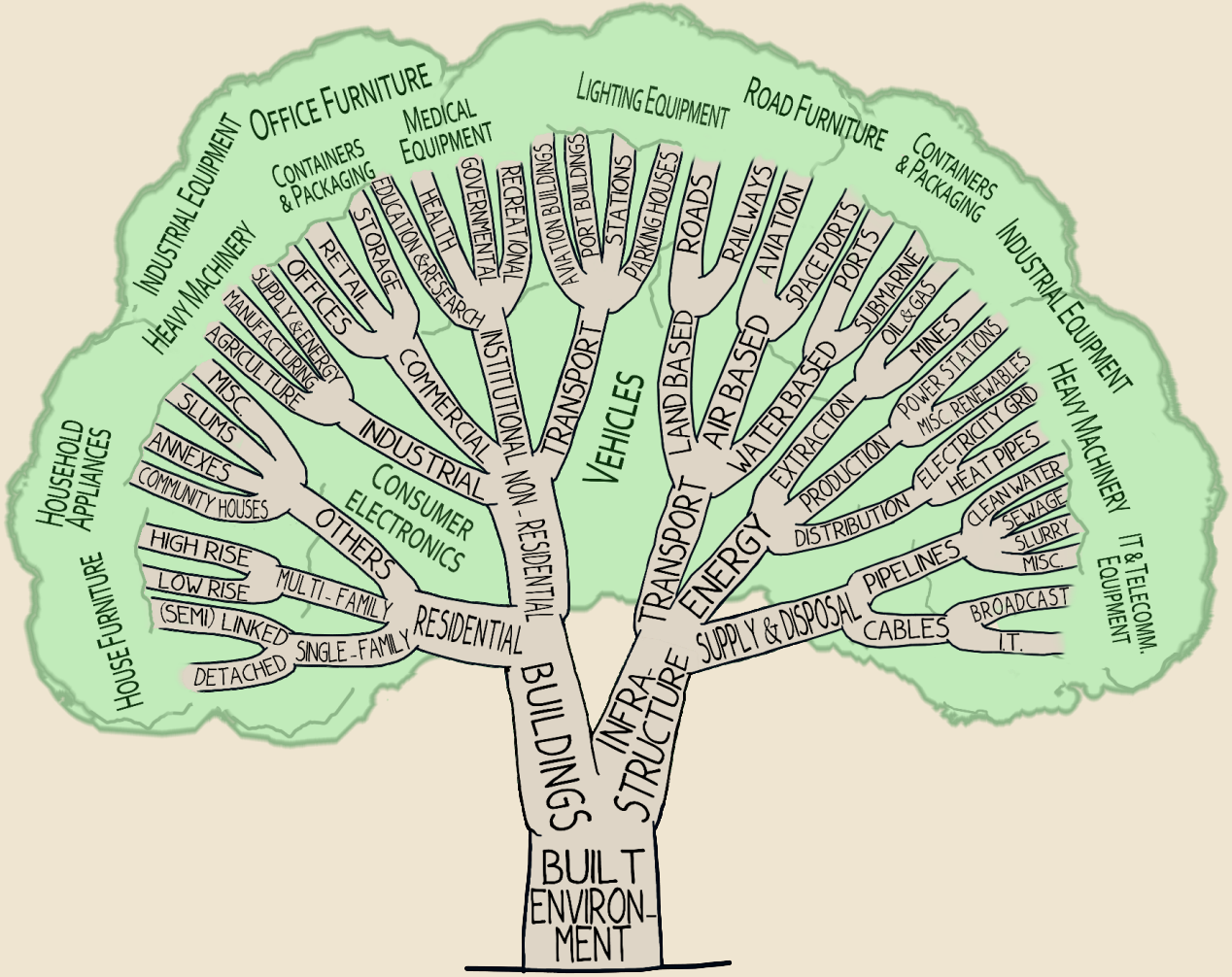
STOCKS HAVE BEEN LESS STUDIED, BUT ARE CRITICAL

Stocks are important:

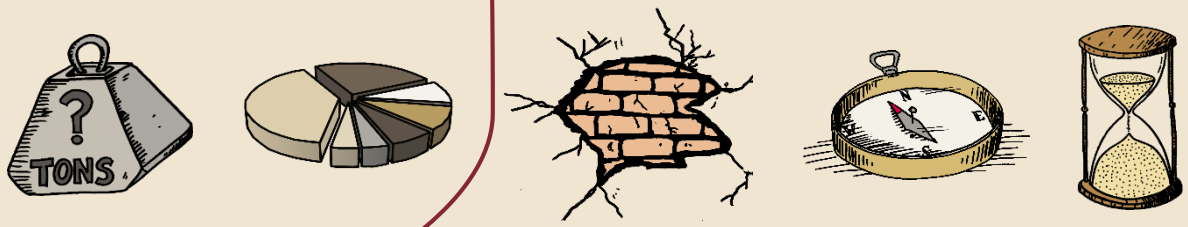
- Service providers
- Resource repositories
- Dynamic determiners
- Consumption couplers
- City shapers



Linked with society, materials, energy, and emissions → Important assets for both upstream & downstream sustainable measures. Need to characterize and understand urban built environment stocks better.

PH.D. PROJECT'S AIM & SCOPE

To **characterize** the **stocks** of urban built environment, their historical dynamics and implications on urban **dematerialization** and **decarbonization** strategies using Chinese cities as examples.



Stocks studied

- Buildings
- Infrastructures
  - Roads
  - Railways
  - Metro

Time Frame

- Retrospective: 1950 – now
- Prospective: now – 2100

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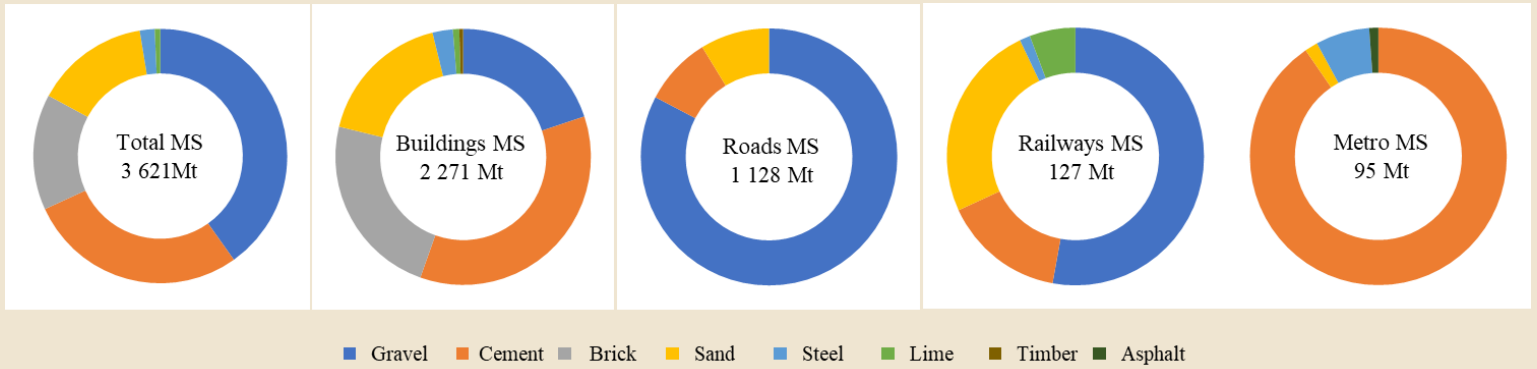
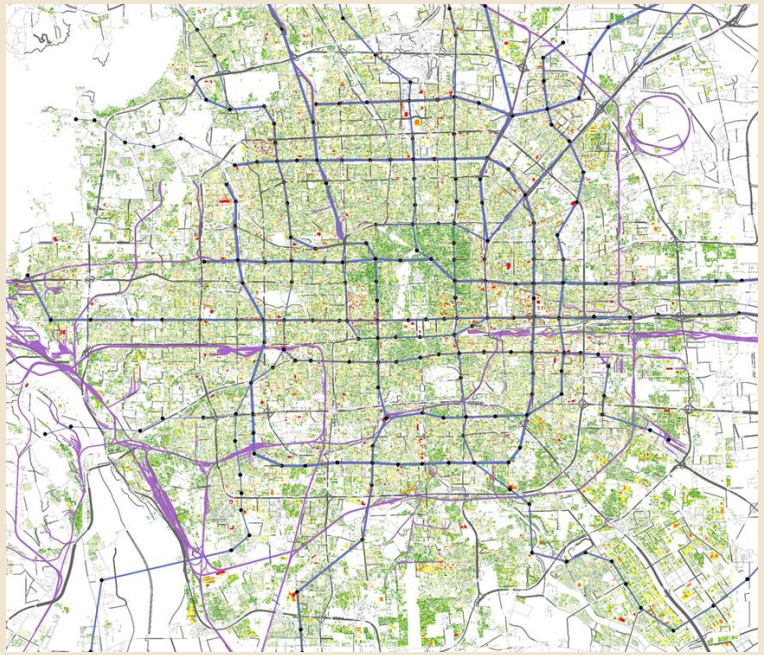
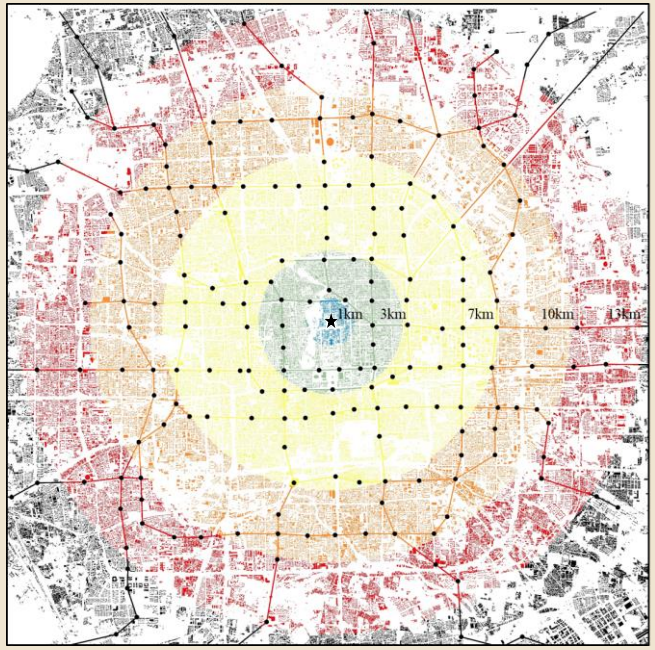
BEIJING MATERIAL STOCKS, 2018

buildings, roads, railways and subways

- **Total Material Stock: 3,621 Million tons**
  - 140 tons/cap
  - 1,457 thousand t/km2







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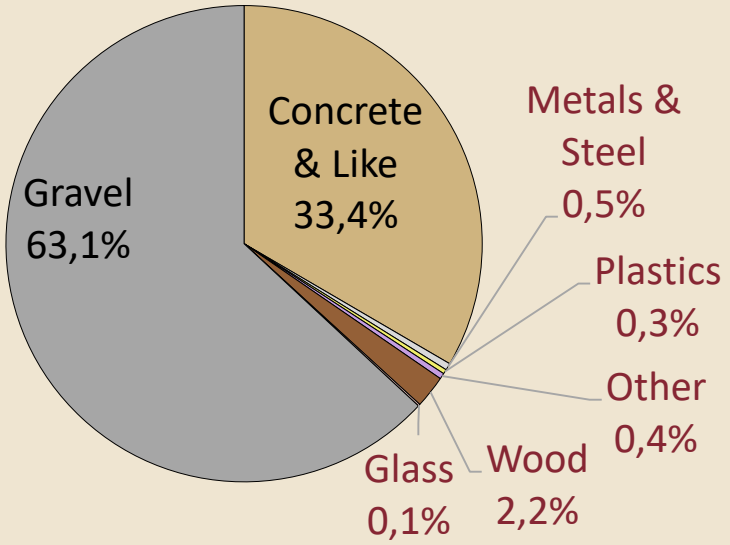
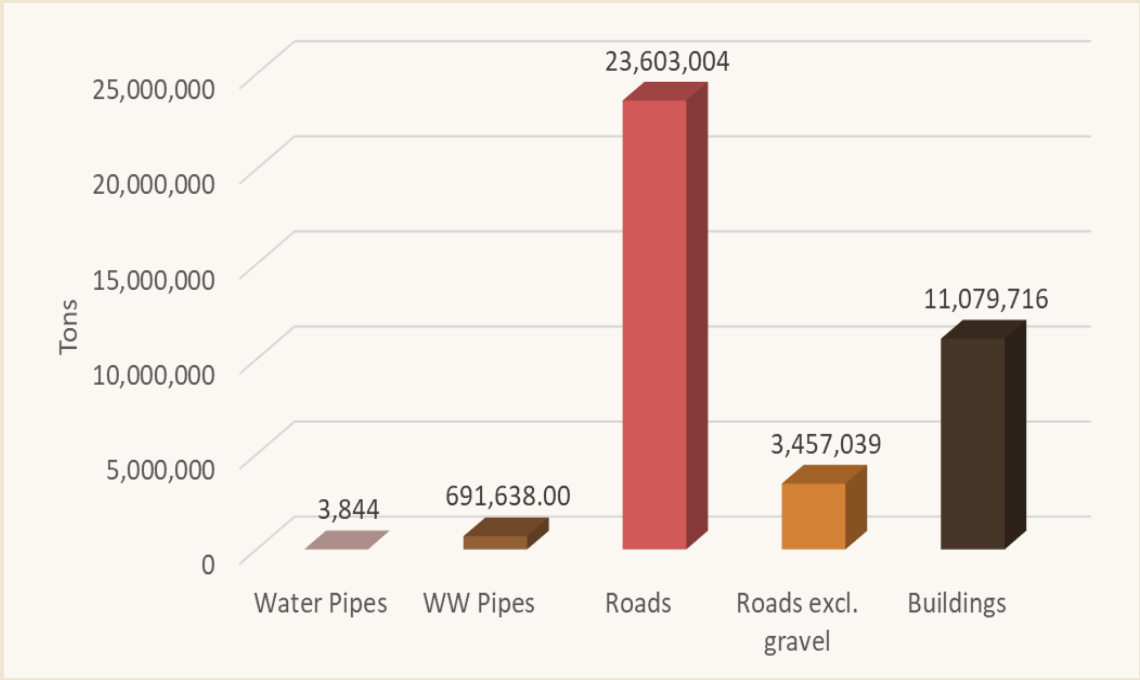
Pilot Study: Odense Material Stocks, 2016 (Mälgand 2017)

Buildings, roads and waterpipes

- **Total : 35 Million tons**
  - 176 tons/cap
  - 116 tons/km2





Thank you!

Ruichang Mao

rma@kbm.sdu.dk

T +45 65 50 75 93

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