

Ecologies of Construction: Urban Metabolism 01

©john e. fernandez sa+p:mit - building technology program

Urban metabolism

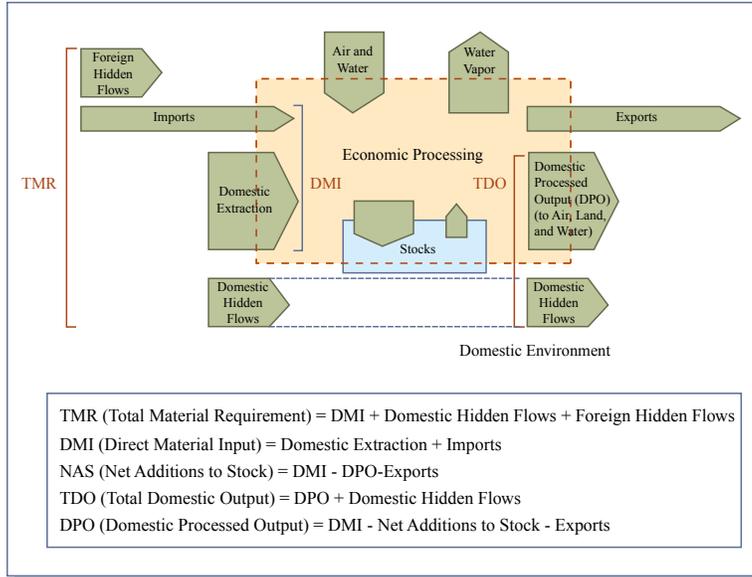


Image by MIT OCW.

Figure: The material cycle

Adapted from: Mathews et al. (2000) The Weight of Nations: material outflows from industrial economies. World Resources Institute, Washington DC: pg. 14

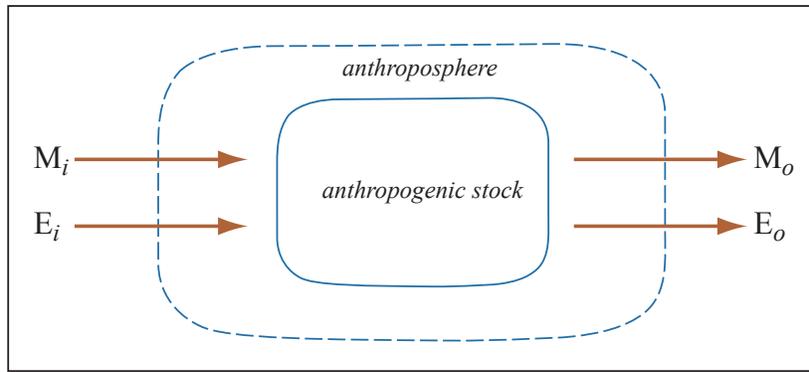


Figure by MIT OCW.

source: Fernandez, J. (2005) The metabolism of buildings: the unique spatial, temporal and physical attributes of contemporary construction. Working paper.

Facts regarding contemporary urban centers

- By 2003: urban population = 3 billion people = world population in 1960
- Today almost $\frac{1}{2}$ world's total population lives in cities (only 15% in 1900) (Davis reading 01)

Image removed due to copyright restrictions

(Rio de Janeiro, Brazil, 2004)

Facts regarding contemporary urban centers

- During the 20th century the world's urban population increased by a **factor of 10**
- Most of the **largest cities** are now in Asia, not Europe or North America
- Asia alone contains almost **half of the world's urban population** (even though 3/5ths of it population still live in rural areas).
- Urban population of Africa, Asia, Latin America and Caribbean is now **nearly three times** the size of the urban population of the remainder of the world.
- United Nations estimates that between 2000 and 2010, **85% of world population growth** will be in urban areas (virtually all of this growth will be in Africa, Asia and Latin America).
- That is, a large number of urban centers are **not growing rapidly** (developed western countries).
- **Megacities** are a concern but have not grown nearly as large or rapidly as predicted; by 2000, 16 cities with 10million inhabitants or more.
 - Though today world is less dominated by megacities than once anticipated.
 - For example, in 2000 Mexico City had 18 million, not the 31 million predicted 25 years ago.
 - Kolkata (formerly Calcutta) 13 million, not 40-50 million predicted.
 - Sao Paolo, Rio de Janeiro, Seoul, Cairo – all several million less than expected.
 - Overall the world's population 270 million less than predicted 20 years previously (Satterthwaite, D. 2002. *Coping with rapid urban growth*. London: R. Inst. Chart. Surv. 35 pp.)

source:

Drivers of urban growth

1. The globalization of the economy and the birth of global cities.
 - **National economies** under globalization: 2000, five of the world's largest economies (US, China, Japan, India, Germany) contained 9 of the world's 16 megacities and 46% of cities of a million inhabitants or more.
 - 2000, all but two of the world's 16 megacities and more than 2/3rds of its million inhabitants cities were in the 20 largest economies.

2. Global finance concentrates in very large "global" (often coastal) cities.
 - Only a handful of cities, New York, London, Shanghai, Tokyo... qualify as **international centers of finance**, but the growth of these cities (and their inevitably rising levels of income and wealth) spur the growth of a vast array of secondary cities of trade and production.

3. Migrants seek higher incomes.
 - Cities as centers of production and offering diverse **employment** opportunities attract migrants from the countryside.

source:

Three reasons for considering cities as pivotal to **sustainable development**

1. The world is increasingly urban

- Half the world lives in cities – this is likely to grow.
- 2000, all but two of the world's 16 megacities and more than 2/3rds of its million inhabitants cities were in the 20 largest economies.
- Even though cities concentrate wealth, a significant proportion of the world's population living with unmet needs lives in cities.
- Much of the new population density has (and will continue) to occur on the coasts – areas particularly susceptible to massive loss of life from disaster.

2. Cities concentrate world's wealth

- Structural change in production, regulation and finance originates from cities. Location of paradigm shifts in culture.

3. Much of the world's middle- and upper-income groups live and work in cities (highly concentrated consumption)

- Primary draw on rural resource demands.
- Primary producer of greenhouse gas emissions (either locally or remotely).
- Primary source of waste, waterborne and solid.

source:

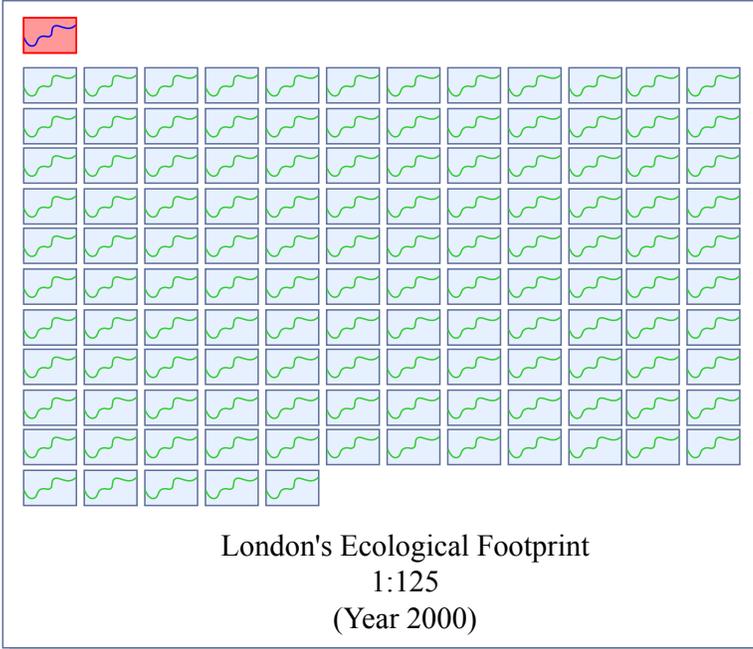


Image by MIT OCW.

Adapted from: Jopling, J. and H. Girardet. 1996. *Creating a Sustainable London*. London: Sustainable London Trust. 45 pp.

Urban metabolism

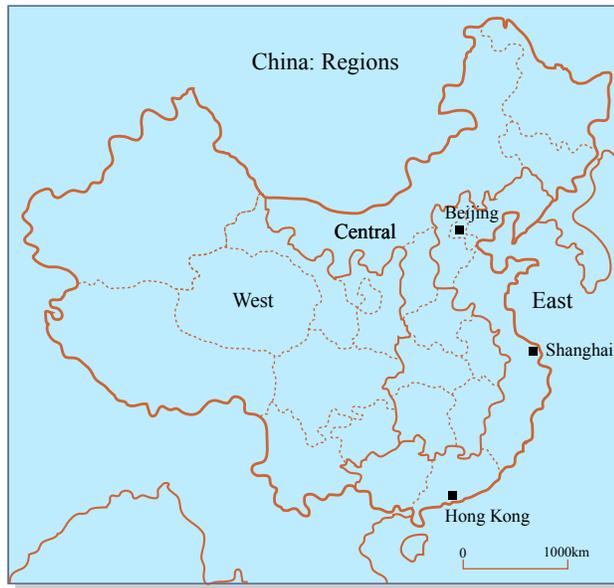


Image by MIT OCW.

source:

Facts regarding massive Chinese urbanization

- China's economy has recently surpassed France, Britain and Italy to become the **fourth largest** in the world behind the United States, Japan and Germany.
- And, the country's leaders are intent on **quadrupling the economy** by 2020
- Between 1953 and 2003 the **population of China doubled**, while the **urban population tripled**.
- **Six hundred and sixty cities** are now home to more than half a billion Chinese out of a total of 1.3 billion.
- The intensive urbanization of China has produced **170 cities of one million** or more residents each.
- For example, in 2005 **Shanghai** alone added more space in the form of residential and commercial towers than exists in all of New York City (Barboza 2005).
- China now accounts for **1/3 of all new construction** in the world.
- On average, China has been adding **2 billion** square meters of space annually. In 2005, China added **4.8 billion square meters**.
- It is estimated by 2020, **20 to 30 billion** square meters will have been added to Chinese cities, according to Qiu Baoxing the vice-minister of Construction (Xinhua(a) 2006).
- Currently China's per capita energy usage is well below most developed nations at **50 percent** of the global average. Along with economic development, improvements in the standard of living and consumption and the steady movement of large portions of the population to urban areas virtually assures a dramatic increase of per capita energy use approaching that of developed nations within 10 to 15 years.
- China is heading toward a great transformation **from rural to urban**.

source:

Urban metabolism

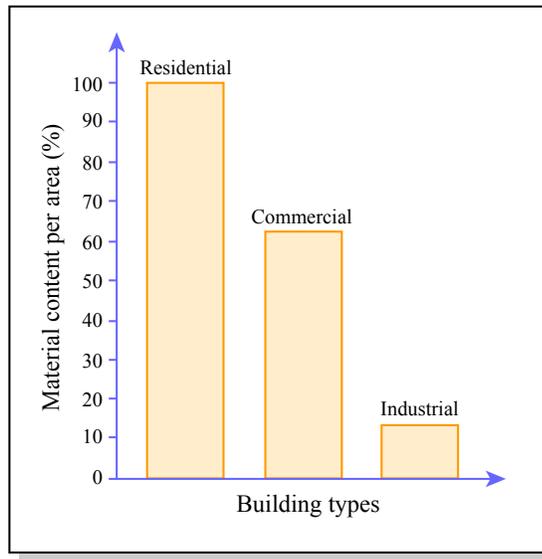


Image by MIT OCW.

source:

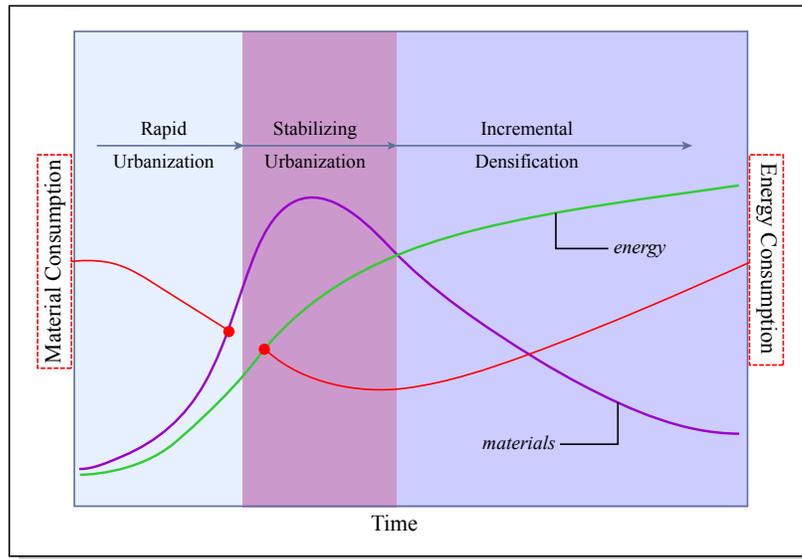


Image by MIT OCW.

source:

Obstacles to reaching sustainable urban development

1. A persistent interest in producing sustainable cities as opposed to an urban world that reduces its environmental burden.
 - A tendency not to focus on real consumption of local, regional, national and global resources.
2. Cities easily export their environmental problems.
 - Environmental, economic and equity (social).
3. Income disparities ensure unjust environmental equity
 - Much growth has come about not through formal growth in infrastructure, housing and transportation, but in the enormous "informal" squatter settlements. (Davis reading 02)