Urban sustainability

Haughton, G. (1999). Environmental justice and the sustainable city. *Journal of Planning Education and Research*, *18*(3), 233-243.

Fan, P., Ouyang, Z., Nguyen, D. D., Nguyen, T. T. H., Park, H., & Chen, J. (2019). Urbanization, economic development, environmental and social changes in transitional economies: Vietnam after *Doimoi*. *Landscape and urban planning*, *187*, 145-155.

Part A. sustainability or sustainable development

1. What is it?
2. How is it defined?
   - Historically
   - Disciplinary (ecological, cultural, planning)
3. How to achieve it?
4. What is its internal structure? System properties?

1. What is it? Sustainability, Sustainable Development

- Ecological Sustainability (Environment)
  - Sustainable, to be sustained
  - Ecological carrying capacity
    - Maximum capacity & optimum carrying capacity
    - The effect of human behavior (the tragic of commons)
- Meeting human needs (Development)
  - People, Economy, Society

2. How is it define? Origins of "sustainability" concept

- German foresters in 19th Century
- 1960s environmentalism
  - The Limits to Growth
- 1970s Energy Crisis
- 1974 Conference of the World Council of Churches
  - Sustainable Society
- 1987 WCED: the Bruntland Commission Report
- 1992 Earth Summit (Rio de Janeiro): Agenda 21

4

Brundtland Commission, 1987

- Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs

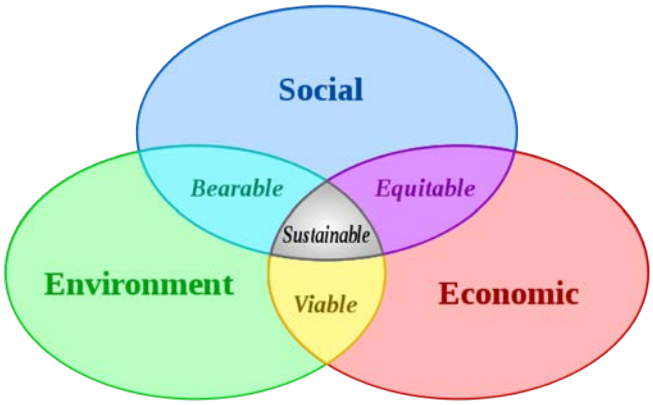
Agenda 21

- A global partnership for sustainable development designed to achieve 'the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems, and a safer, more prosperous future.'

3. How to achieve it?

- Set goals
  - UN Millennium Declaration (2015)
  - Board on Sustainable Development (<= 2050)
  - Global Scenario group (>2050)
- Set Measurements (use indicators)
- Practice
  - Social movement
  - Institutional mechanism
  - Sustainability S&T
  - Planning

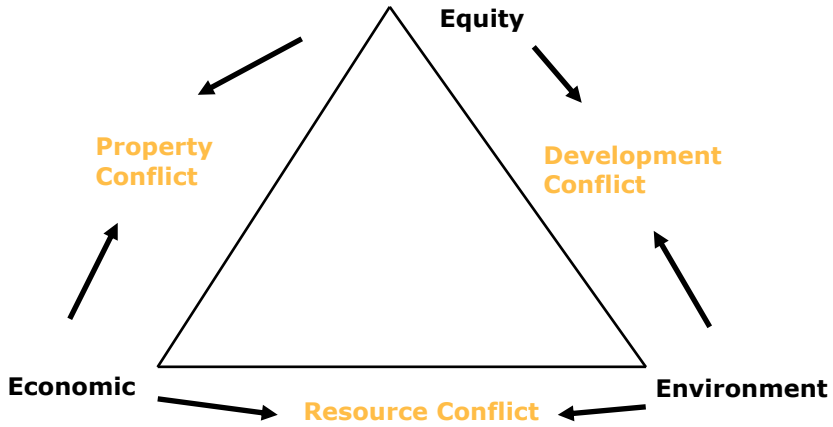
4. What is its internal structure? System properties?
–Three pillars of Sustainable development



Triangular model: "divergent priorities of planning" --Conflicts

Implications:

- Resolving property conflicts (trickle down economics) Kuznets Curve
- Resolving resource conflicts (trickle down environmentalism) Kuznets Environmental Curve
- Social view of nature
  - anthropocentric vs ecopocentric



Campbell, S. (1996). Green cities, growing cities, just cities?: Urban planning and the contradictions of sustainable development. *Journal of the American Planning Association*, *62*(3), 296-312.

Tasks ahead of planners: Procedural Paths

- Conflict resolution & negotiation
- Redefining the language of the conflict
- Other (political pluralism, market mechanism)

Substantive Paths

- Land use and design
- Bioregionalism
- Other (tech improvement)

- Merging the substantive & procedure
- Planners: leaders or followers in resolving eco-env conflicts

Part B .
Planning for (urban) sustainability

1. Why cities?
2. What has been done in the past?
3. How to measure it?
4. What are the ethical underpinnings?
5. What are its internal structure? System properties?
6. Cities in action, visions for sustainable cities

1. Why Cities?

Urban Sustainability

Cities as problems

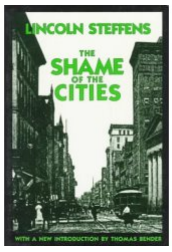
- Bad governance, corruption
- Social injustice
- Environment degradation
- Other….
  - Cold cities
  - Unhealthy cities
  - Dangerous cities

Jacob Riis

A Ludlow Street sweat shop,

How the Other Half Lives
a study of live in New York's tenements published in 1890, demonstrated the horrific conditions of tenement areas

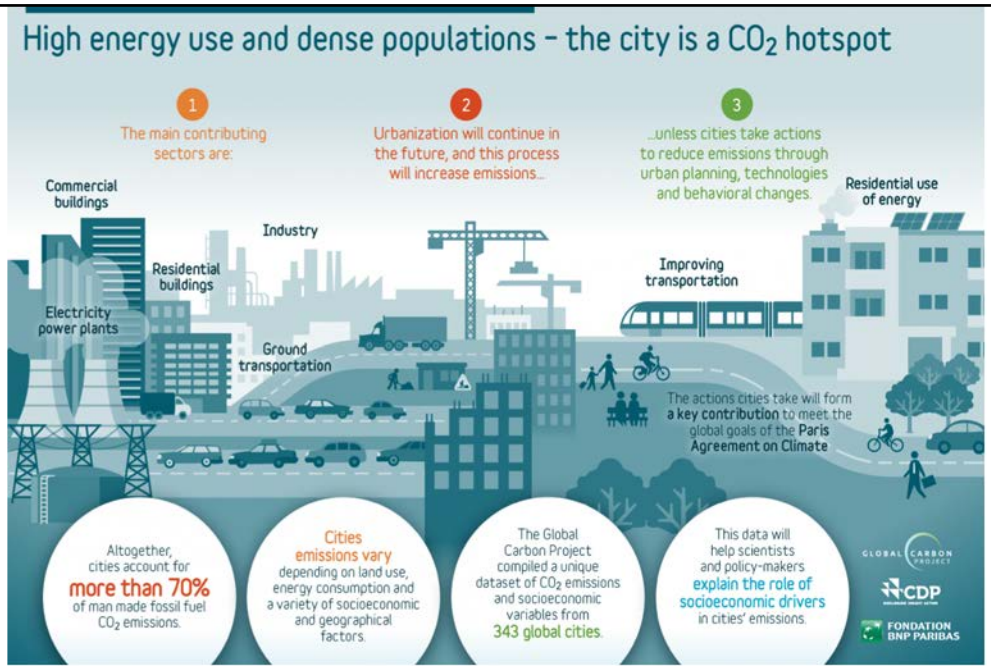
Lincoln Steffens
The Shame of the Cities
(1904)



expose public corruption in many major cities throughout the United States

Cities degrading the global environment

- Small land, big impact (ecologic footprint, GHG)
- cities are "*…responsible for 75 per cent of global energy consumption and 80 per cent of greenhouse gas emissions" (UN, 2007)*
- cities contribute "*…approximately 75 per cent of all heat-trapping greenhouse gas emissions to our atmosphere, while only comprising 2 per cent of land mass." (Clinton Foundation)*
- London's ecological footprint "*…extends to around 125 times its surface area of 159,000 hectares, or nearly 20 million hectares" (*Girardet, 1998)



Source: http://www.globalcarbonatlas.org/en/content/global-cities-emissions

However, Cities can be Solution in an Urbanizing World

Advantages of cities

- Lower infrastructure cost per capita/HH
  - water, sewer, garbage collection, utility, telecom, health, education, etc
- Efficient use of resources
  - lower cost for collection of recyclable or reusable wastes per person
- Lower demand for land per capita
- Lower fossil-fuel use
  - heat source, building pattern
- Potential for limiting the use of motor vehicles
- Artefacts
  - Examples of cities or city districts (Street Ballet of the East Side by Jacobs)
- Social economy

Positive effects of city life

- the beginning of what is distinctively modern in our civilization is best signalized by the growth of great cities (Louis Wirth)
  - metropolitan civilization is without question the best civilization that human beings have ever devised;
  - the city everywhere has been the center of freedom and toleration, the home of progress, of invention, of science, of rationality“ or: “the history of civilization can be written in terms of the history of cities”.

Sources of inspirations, sustainable cities from the world

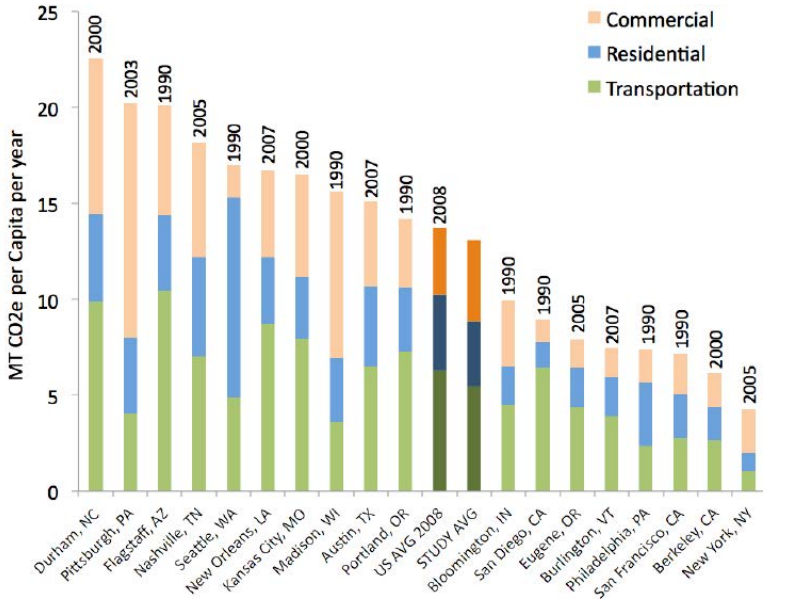
- North America
  - Portland, Seattle, Chicago, Burlington, etc
- Europe
  - Freiberg, Amsterdam, Copenhagen, Stockholm, London,
- Asia Pacific
  - Tokyo, Seoul
- Developing World - Latin America
  - Curitiba, , Porto Alegre

City (date of study)	Total GHG emissions (million tonnes CO_2 equivalent)*	GHG emissions per capita (tonnes of CO_2 equivalent)	National GHG emissions per capita (tonnes of CO_2 equivalent)[11]	City emissions as percentage of national emissions (per capita)
European cities				
Barcelona (1996)[1]	5.1	3.4	10.03 (2004)	33.9%
Glasgow (2004)[2]	12.5	8.4	11.19 (2004)	75.1%
London (2006)[3]	44.3	6.2	11.19 (2004)	55.2%
North American cities				
District of Columbia (2005)[4]	11.3	19.7	23.92 (2004)	82.4%
New York City (2005)[5]	58.3	7.1	23.92 (2004)	29.7%
Toronto (2001)[6]	37.1	8.2	23.72 (2004)	34.4%
South American cities				
Rio de Janeiro (1998)[7]	12.8	2.3	8.2 (1994)	28.0%
São Paulo (2003)[8]	15.7	1.5	8.2 (1994)	18.3%
Asian cities				
Beijing (1998)[9]	n/a	6.9	3.36 (1994)	205.4%
Seoul (1998)[9]	n/a	3.8	6.75 (1990)	56.3%
Shanghai (1998)[9]	n/a	8.1	3.36 (1994)	241.1%
Tokyo (1998)[9]	n/a	4.8	10.59 (2004)	45.3%
Older case studies (all figures for 1988)[10]				
Ankara	–	3.6	–	–
Bologna	–	5.7	–	–
Copenhagen	–	7.5	–	–
Dade County (Miami)	–	11.6	–	–
Denver	–	22.3	–	–
Hanover	–	10.6	–	–
Heidelberg	–	7.9	–	–
Helsinki	–	8.3	–	–
Minneapolis	–	17.5	–	–
Portland	–	10.1	–	–
Saarbrucken	–	10.4	–	–
San Jose	–	8.8	–	–
Toronto City	–	15.0	–	–
Toronto Metro	–	13.5	–	–

Source: Dodman, 2009

Community greenhouse gas emissions per capita for 19 US cities as compared to US average

(EPA 2010a, US Census Bureau 2010a, US Census Bureau 2010b; SI (available at stacks.iop.org/ERL/6/034003/mmedia) for inventory references).



2. What have been done in the past? Planning and sustainability (1)

- 1980s & 1990s: rise of urban sustainability
  - Local Agenda 21
  - Habitat Agenda
- Past planning visionaries
  - human-scale, environmental sensitive
  - Howard, Geddes, Mumford, Jacobs, McHarg, Lynch
- New Paradigm for planning?
- Recent urban planning problems
  - Sprawl, auto-centered development, central city-suburban income disparity, affordable housing

2. What have been done in the past? Planning and sustainability (2) –Metro Planning

- Late 19th century:
  - Metro planning: Europe vs. US
  - Urban visionaries
  - City Beautiful Movement
- RPAA: continue metro planning
- Auto age (1920s -) suburbanization – pragmatic metro planning
- After WWII: Europe – metro planning
- US 1950s & 60s – city-county consolidations
- 1980s: decline of metro planning
- 1990s: revival of interest in metro planning
- Dilemma: emergence of metro regions vs. lack of mechanism to govern

3. How to measure it?

a city's environmental performance within and beyond its boundary

- Sustainable city movement?
  - European cities (Timothy Beatly)
  - Curitiba (Brazil), Ilo (Peru)
  - Healthy cities
- The North vs. South divide
  - The historic effect
  - The economic growth argument
  - The per capita inequality

Environment performance of cities

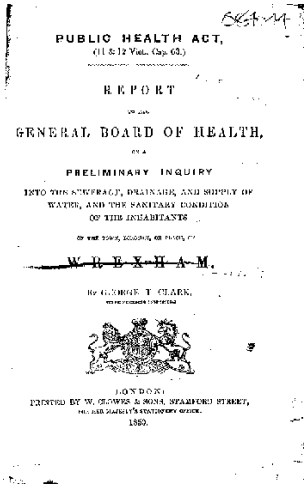
- Difficult to compare env. performance of cities
  - env. health, env. hazard generation per capita
  - Transfer of the environment cost
- 5 categories of environment actions
- Two aims of the article
  - Improve env. quality within one's own boundary
  - Reducing the transfer of env. cost to others (people, ecosystems, future – institutional difficulties

Category1. Controlling infectious and parasitic diseases

- Causes
  - due to lack of provision for water, sanitation, drainage, garbage collection and health care
- The past and current
  - At the beginning of the industrial revolution: London, Manchester (Engels), New York
  - The current problems of cities in the South
  - Vulnerable population: infant, children, elderly
- Characteristic of the current diseases
  - Growing new or emerging diseases (AIDS)
  - Re-emergence of old ones (cholera, malaria, dengue fever, tuberculosis)
- Main reasons:
  - Low priority by the governments and int'l agencies
  - Urbanization and migration
  - Resistance and adaptation of the disease-causing agents

TB and Cholera in London

Public regulation – The Sanitary Reform



PUBLIC HEALTH ACT,
(11 & 12 Vict. Cap. 63.)

REPORT
OF THE
GENERAL BOARD OF HEALTH,
ON A
PRELIMINARY INQUIRY
INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF
WATER, AND THE SANITARY CONDITION
OF THE INHABITANTS
OF THE TOWN, BOROUGH, OR PARISH, OF
~~W H E X H A M.~~
BY GEORGE T. CLARK,
LONDON:
PRINTED BY W. CLOWES & SONS, STAMFORD STREET,
1850.

Edwin Chadwick:

Underlie modern urban planning

- Construction of urban sewer
- Sanitary survey and planning
- Town site consciousness

Category 2. Reducing Chemical and Physical Hazards

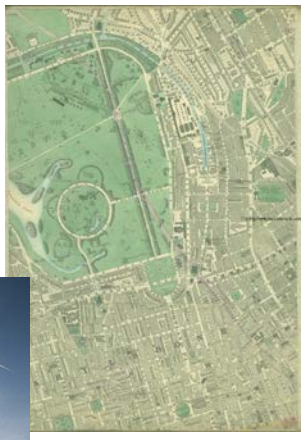
- Causes: industrial production, road traffic
- Regulating activities of enterprises and individuals
  - Controlling occupational hazards
  - Indoor air pollution (coal and biomass as domestic fuels)
  - Controlling Accidents within home and immediate surrounds (temporary shelter, open fires or stoves for cooking, hazardous location sites
  - Emergency services
  - Controlling air and water pollution

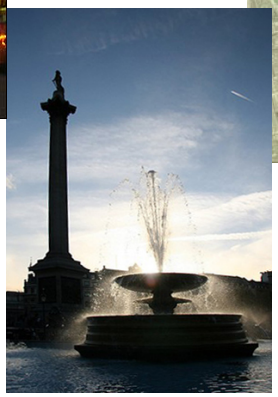
Category 3. High Quality City Environment

- Goal: beyond the survival issues of the first 2 categories, provide pleasant, safe, and valuable city environment
  - Open space per capita and access
  - Natural landscape protection
- Rapidly growing South cities, the neglect issue

Redevelopment

London
John Nash

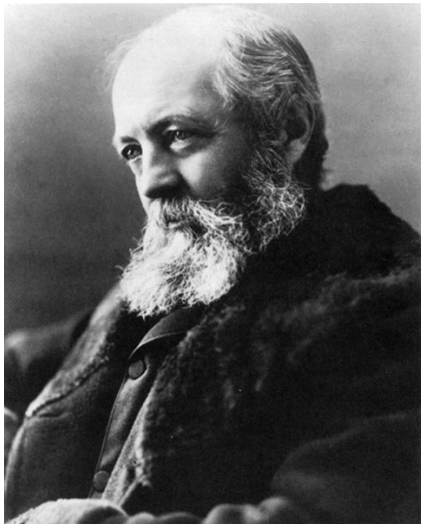




Regent's Park and
Regent Street

Urban Parks in America

Central Park, NYC



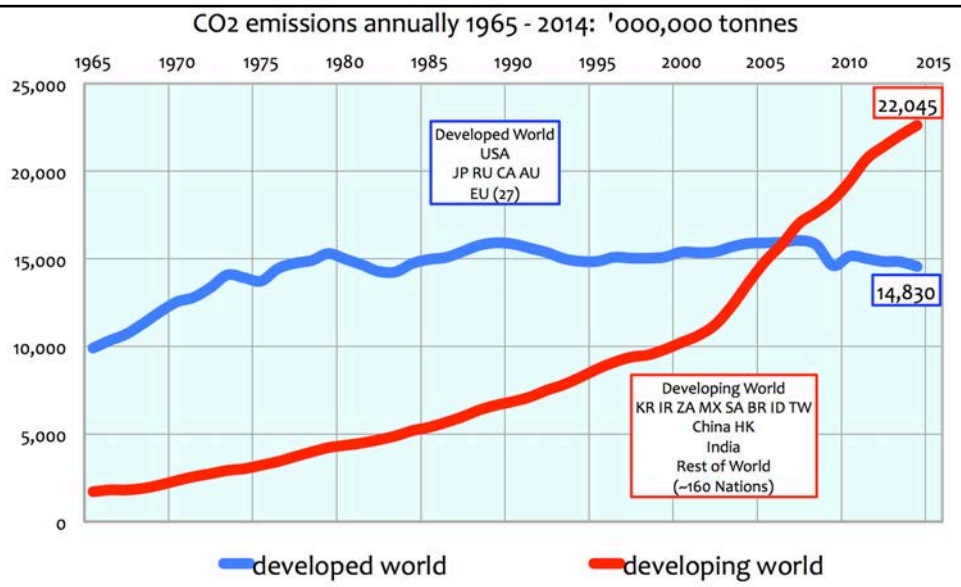
Frederick Law Olmsted

Category 4. Minimizing the Transfer of environment cost to the inhabitants and ecosystems surrounding the city

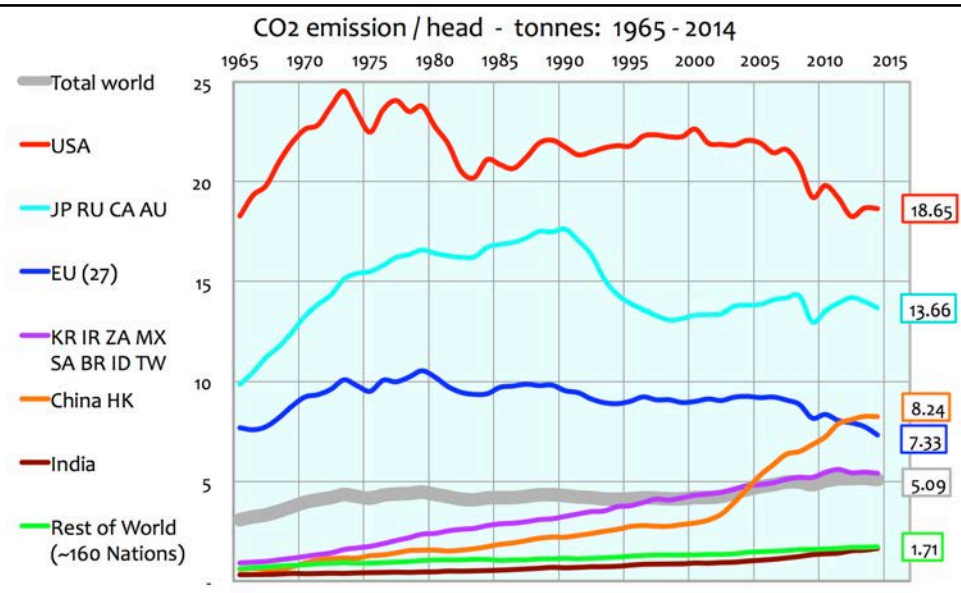
- Transfer to the "city-region"
- Ecology of the region transformed
  - Hydrologic cycle
  - Waste water
  - Solid wastes disposal around the city
  - Air pollution => acid rain
  - Down-wind effect
- The actions in the north
  - Environmentalism in the 1960s

Category 5. Sustainable consumption

- Transfer to the "far-away" regions /future
- Consumption needs <= import from the distant
- Air pollution –CO2 (global warming)



Source: http://euanmearns.com/the-record-of-recent-man-made-co2-emissions-1965-2014/



Source: http://euanmearns.com/the-record-of-recent-man-made-co2-emissions-1965-2014/

Assessing the impact & intervention framework

- Ecological footprint
- Historical evolution of government intervention
  - Sanitary reform
  - Zoning, planning
  - Olmsted (open space)
  - National and international level of the 4th and 5th elements
- Corresponding responsibility: local, national, global
- Institutional difficulty
  - Environmental racism
  - The broken linkage of jurisdiction
  - Prevent transfer
- green consumerism; eco-labeling, fair-trade, ethical sourcing

Sustainability, Poverty and Urban Environmental Transition (UET)

McGranahan et al, 1996

- Current debate of sustainability tend to marginalize the primary environmental concerns of the poor
- Linking different environmental problems of the poor and the affluent

Urban Environment Transition

- 1. Poor cities or poor homes, neighborhoods and workplaces principally located in the South
  - tend to have localized, immediate and health-threatening environmental issues,
  - such as diarrheal diseases and acute respiratory infections, due to inadequate household water supplies and sanitation, and smoky kitchens.

Tondo District, Manila
Density: 80,000 people/km2,
lack adequate water, housing, sanitation, education, health, and employment

Source: BBC picture gallery

Tondo District, Manila; Source: BBC picture gallery
Children spend hours swimming in the river which run through Tondo, but parts of it are choked with garbage.

Photo taken by Peilei Fan on Nov. 7, 2022 in Taytay, a provincical city close to Metro Manila

Photo taken by Peilei Fan on Nov. 11, 2022 in City of Iloilo in the Philippines, a city renowned for its rich history and culture.

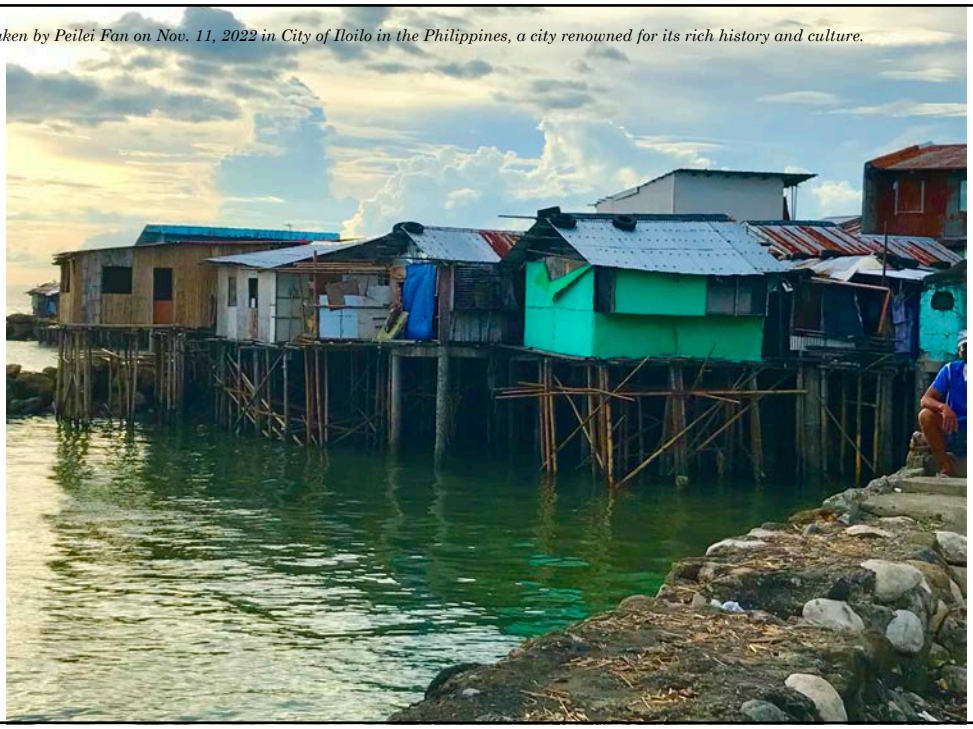


Photo taken by Peilei Fan on Nov. 11, 2022 in City of Iloilo in the Philippines, a city renowned for its rich history and culture.

- 2. Middle-income cities, particularly middle-income cities in the South and industrial cities of the formerly planned economies,
  - will have citywide or regionally somewhat more delayed environmental problems that are threats to both health and ecological sustainability.
  - Typical examples include polluted waterways due to untreated sewage and industrial waste water and ambient air pollution due to concentrations of smoke, sulfur dioxide and particulates generated by industrial production.

Industrial pollution in Benxi, China

Source: https://gabrielsmessage.wordpress.com/2011/09/01/gods-creation-is-pro

Hebei Province Shexian Tianjin Iron and steel plant (河北省涉县天津钢铁厂) is a heavily polluting company. Company scale is still growing, seriously affecting the lives of local residents. March 18, 2008

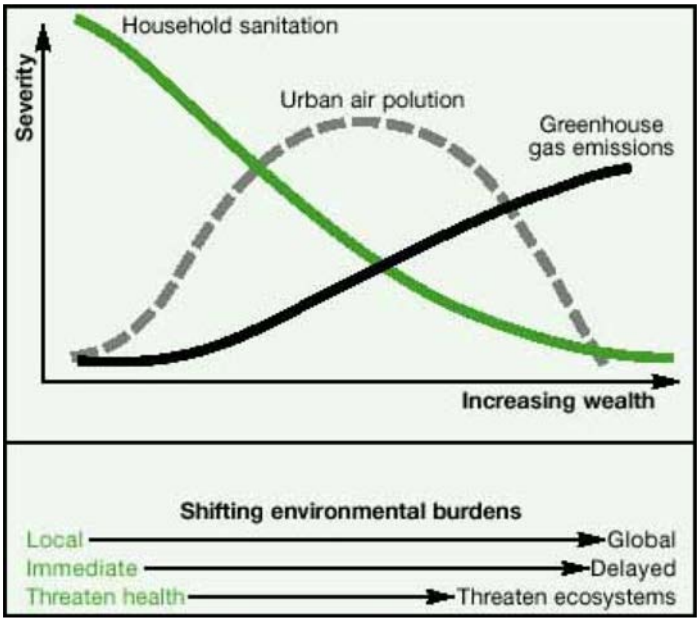
High rise condominiums (left), government buildings (up right), and residential houses (lower right) burn coals for heating. Photos were taken by Dr. Qingdong Shi at Xinjiang University, Urumqi, China, on Jan. 30, 2009.

- 3. Affluent cities
  - generate global and intergenerational environmental burdens, which are primarily threats to sustainability.
  - For instance, research indicates that affluent cities contribute most of the global carbon emissions; further, carbon dioxide emissions rise continuously with economic growth.

High ecological footprint caused by suburbanization and consumption style

UET

- Association between a city's affluence, its env., and the health of its citizens
- The spatial shifting
- The temporal shifting
- Within a city, env. burdens are borne unevenly



Source:
http://collections.infocollections.org/ukedu/en/d/Js0749e/7.3.6.1.html

4. What are the ethical underpinnings?

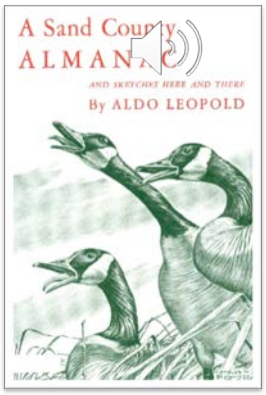
5 Equity principles

A spectrum from light to deep green

- Light green (weak version)
  - Largely anthropocentric view
  - Technological solutions to env. problems
  - Substitutability of natural capital with human capital
  - E.g.??
- Deep green
  - More nature centered view
  - Reducing overall consumption to prevent destruction of natural assets beyond the regenerative capacity
  - Against wholesale substitutability of natural capital with human capital
  - E.g. ??

Aldo Leopold

- A Sand County Almanac (1948)
- Conservation Esthetic
- Land Ethics



5 Central equity principles

- Intergenerational equity
- Intragenerational equity
  - Contemporary social equity/justice
- Geographical equity (transfrontier responsibility)
- Procedural equity
  - All people are treated openly and fairly
- Interspecies equity

6. Cities in Action
Examples from Portland, Toronto, Bay Area

- Vision & plans
- Political organization and coalition building
- Development of regional institutions
- Intergovernmental incentive framework
- Use of indicators and performance standards
- Participatory planning and consensus building
- Public education and social learning

Future cities?
4 approaches towards sustainable development

- Self-reliant cities
  - Reduce the negative external impacts of a city beyond its own bioregion
  - Local resource, in-situ pollution resolution, decrease consumption, renewable resource, minimize waste
- Redesigning cities
  - Creating a city on human-terms, socially and economically vibrant and viable
  - High density, compact
- Externally dependent cities
  - High economic growth will solve the problems of inequality and environment
  - Kuznets Curve, Kuznets Environment Curve
- Fair shares cities
  - Environment assets are traded on a fair basis, trades do not degrade environments, economies, & societies
  - Reducing use and pollution
  - Linking actions to responses
  - Minimize adverse impact
  - Access to environment equitably distributed

Equity Concern	City Type			
	Externally dependent	Self-reliant	Redesigning cities	Fair shares
Inter-generational	+	+	+	+
Social	?	+	√	+
Geographical	?	??	=	+
Procedural	?	+	=	+
Inter-species	=	+	?	√

+	Positive	=	Neutral/Unclear
√	Implicit	?	Potentially perverse

Table 1. Environmental justice and models of sustainable urban development.

Study Questions

- **Haughton, 1999**
  - 1. What are the five equity principles in environmental justice proposed by Haughton?
  - 2. What are the four approaches towards sustainable development? How have they considered the above-mentioned five equity principles?

Reflections

- What does spatial and temporal scales play in environmental equity and problems each city facing?

Part C . (urban) sustainability in real world
Video, exercises, and a research example

- **Curitiba: Sustainable Development in Brazil?**
- https://www.youtube.com/watch?v=r4sumpEqnlY&t=603s

- Ecological Footprint Calculator
- https://www.footprintcalculator.org/home/en

Vietnam after Doimoi: Urbanization, economic development, environmental and social changes

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research Paper

Urbanization, economic development, environmental and social changes in transitional economies: Vietnam after Doimoi

Peilei Fan[a,*], Zutao Ouyang[b], Dinh Duong Nguyen[c], Thi Thuy Hang Nguyen[d], Hogeun Park[a], Jiquan Chen[e]

Main research findings

1. rapid urban land expansion (increase in the mean value of nighttime light data from -1.4 in 1992 to 4.4 in 2012) The urban population grew at a faster annual rate following *Doimoi* (1986-2015) compared to the pre-*Doimoi* period (1960-1985).
2. At the inter-city level, cities with populations more than 1 million experienced more rapid growth of built-up land intensity and population size compared to the national average. At the intra-city level, conversion from farmland contributed significantly to built-up land in Hanoi and Ho Chi Minh City from 1990 to 2010.
3. As indicated by $PM_{2.5}$ and NO_2 concentrations, urban environments in large cities deteriorated; yet poverty was alleviated, as measured by populations falling under the poverty line and the proportion of the urban population living in slums.
4. Coupled dynamics: (1) economic development strongly influenced urbanization and (2) urbanization and economic development contributed to environmental deterioration while promoting the social conditions.

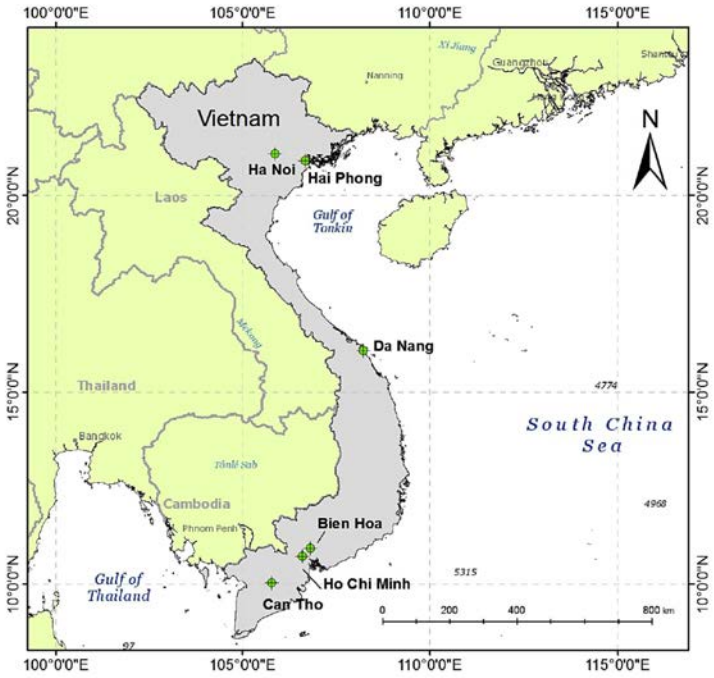


Fig. 1. Vietnam and its six large cities with populations over one million: Ho Chi Minh City, Hanoi, Hai Phong, Da Nang, Can Tho, and Bien Hoa.

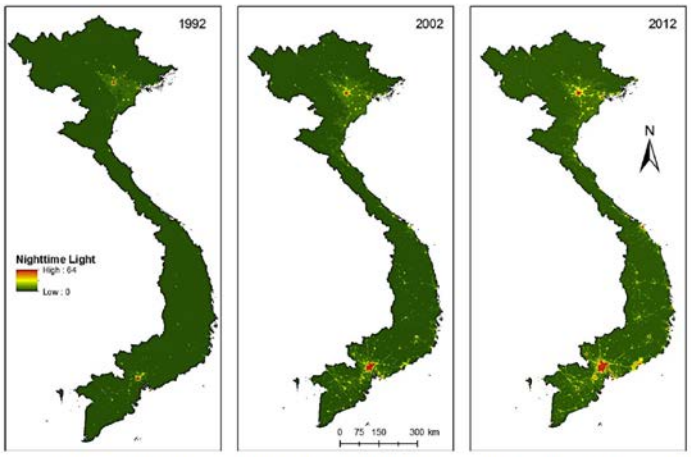


Fig. 2. The spatial distribution of nighttime light (NTL) in original DN Values in Vietnam in 1992, 2002, and 2012. The higher the value of NTL, the higher the density of urban land. The figure shows the emergence of three main urban clusters in Vietnam over the years.

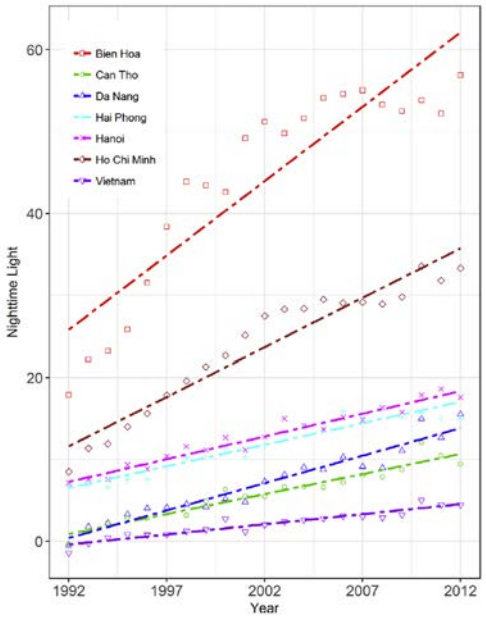


Fig. 3. Annual change of mean nighttime light (relative value from 1 to 64) in the six selected cities as compared to the entire country. All six cities have higher relative values and a steeper slope than the national average value of Vietnam.

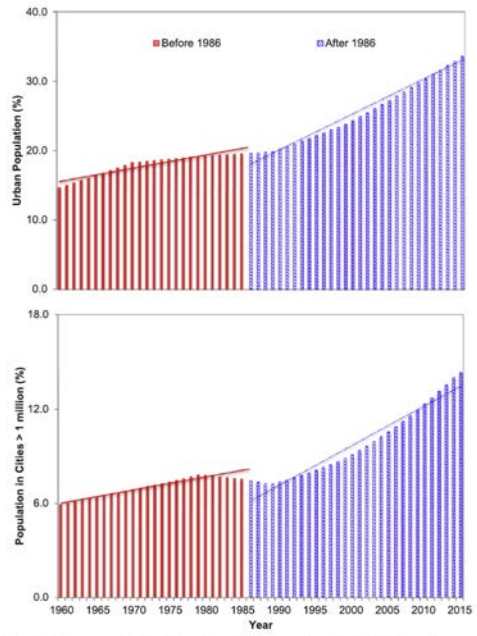


Fig. 4. Urban population dynamics of Vietnam (1960–2015). The urban population grew faster in 1986–2015 than in 1960–85. Cities with > 1 million population grew even faster than the urban population.

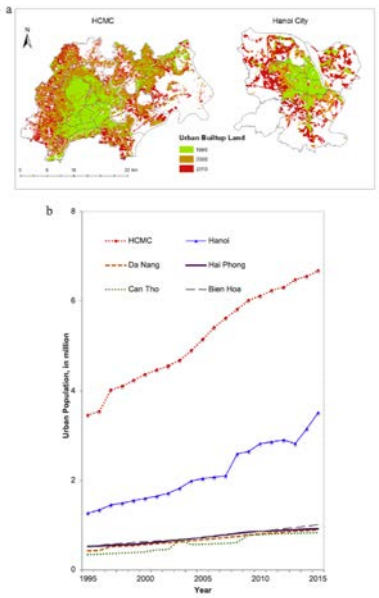


Fig. 5. Urbanization of HCMC and Hanoi, (a) Urban land expansion, (b) Urban population in comparison with four other large cities in Vietnam. Note: We defined the inner city of Hanoi as the twelve urban districts of Ba Dinh, Hoan Kiem, Dong Da, Hai Ba Trung, Thanh Xuan, Cau Giay, Tay Ho, Hoang Mai, Ha Dong, Long Bien, Nam Tu Liem, and Bac Tu Liem. Similarly, we defined the inner city of HCMC as 19 urban districts of District #1–#12, plus the districts of Go Vap, Tan Binh, Tan Phu, Binh Thanh, Phu Nhuan, Thu Duc, and Binh Tan.

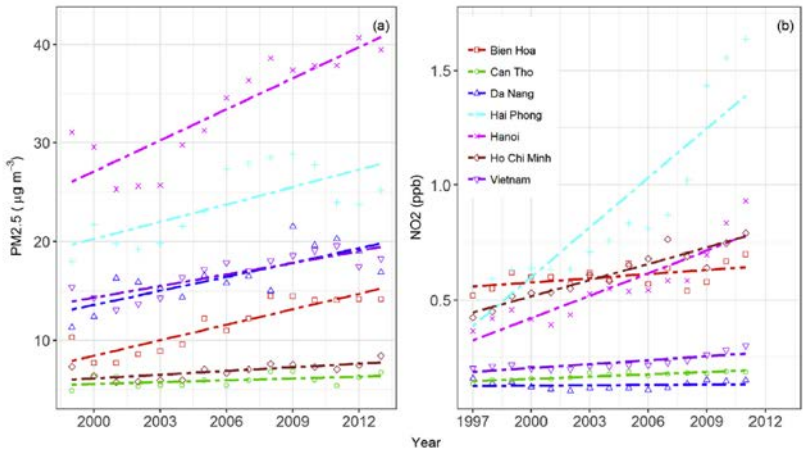


Fig. 6. The annual mean level of air pollutants in the six selected cities as compared to the whole country. Both the $PM_{2.5}$ and NO_2 have increased since 2001 for all six cities as well as for Vietnam.

Table Land use conversion matrix for the inner city of Hanoi and HCMC (km^2)

Area in 2000	Area in 1990 Farmland	Green Land	Built-up Land	Water	Bare Land	Total
Farmland	198.1	0.1	28.3	9.7	0.5	236.6
Green Land	2.4	0.4	1.4	0.8	0.0	5.0
Built-up Land	47.5	2.4	19.7	2.6	0.3	72.6
Water	11.8	0.4	1.1	24.2	1.0	38.5
Bare Land	0.5	0.0	0.0	0.8	0.0	1.3
Total	260.3	3.3	50.5	38.1	1.9	354.0
Area in 2010	Area in 2000 Farmland	Green Land	Built-up Land	Water	Bare Land	Total
Farmland	160.8	0.7	2.3	6.9	0.7	171.3
Green Land	4.8	0.6	1.2	0.6	0.03	7.2
Built-up Land	63.8	2.8	67.8	4.0	0.02	138.4
Water	6.9	0.9	0.9	26.4	0.4	35.4
Bare Land	0.4	0.00	0.4	0.5	0.1	1.5
Total	236.6	5.00	72.6	38.5	1.25	354.0

HCMC

Areas in 2000	Area in 1990 Farmland	Green Land	Built-up Land	Water	Bare Land	Total
Farmland	46.4	93.5	5.6	7.0	0.0	152.5
Green Land	5.9	50.6	1.1	1.2	0.0	58.7
Built-up Land	78.1	60.3	92.8	4.7	0.0	235.8
Water	4.3	8.7	1.3	32.9	0.0	47.2
Bare Land	0.0	0.0	0.0	0.0	0.0	0.0
Total	134.6	213.1	100.8	45.8	0.0	494.6
Area in 2010	Area in 2000 Farmland	Green Land	Built-up Land	Water	Bare Land	Total
Farmland	52.6	12.5	8.7	3.6	0.00	77.3
Green Land	35.2	32.5	12.4	3.5	0.00	83.6
Built-up Land	62.2	12.1	214.2	5.3	0.00	293.8
Water	2.5	1.0	0.6	34.8	0.00	38.9
Bare Land	0.2	0.7	0.01	0.1	0.00	0.9
Total	152.6	58.7	236.0	47.3	0.02	494.6

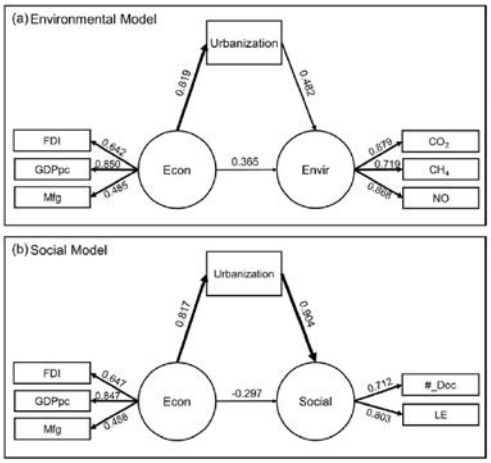


Fig. 7. Partial least squared structural equation modeling (PLS-SEM) of economic development (Econ), urbanization, environmental (Envir), and social conditions in Vietnam (1980–2015). Circles indicate the latent variables and the squares refer to measured variables. The path coefficients describe the relationships between variables and are located on the path. The measured variables are GDPpc, the percentage of the manufacturing value added in GDP (Mfg), the percentage of foreign direct investment in GDP (FDI), CO2 emissions per capita (CO2), CH4 emissions per capita (CH4), and NO emissions per capita (NO), number of doctors per capita (#_Doc), and life expectancy (LE).

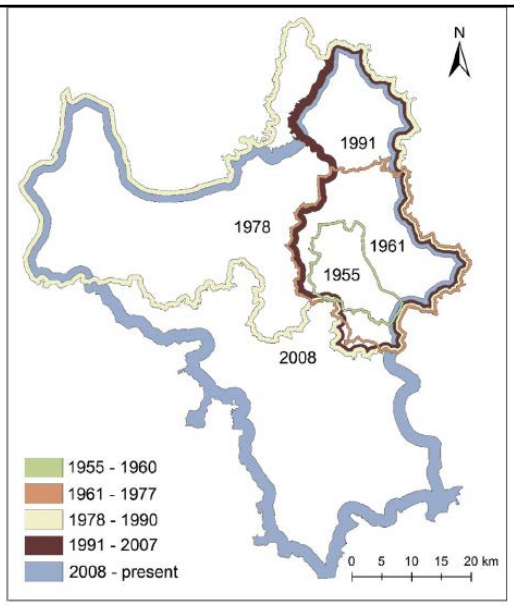


Fig. 8. Changes in the administrative boundaries of Hanoi during 1955–2015. Hanoi had a total area of 152.2 km^2 and 0.53 million population in 1954. Its total area changed to 586.2 km^2, 2130.5 km^2, 922.8 km^2, and 33485 km^2, with populations of 0.92, 2.45, 2.13, and 6.45 million in 1960, 1976, 1991, and 2008, respectively.

urban land expansion was facilitated by local institutional interventions such as frequent changes of administrative boundaries, master plans, and policies

Thank you!