SUSTAINABLE CITIES: ASIA

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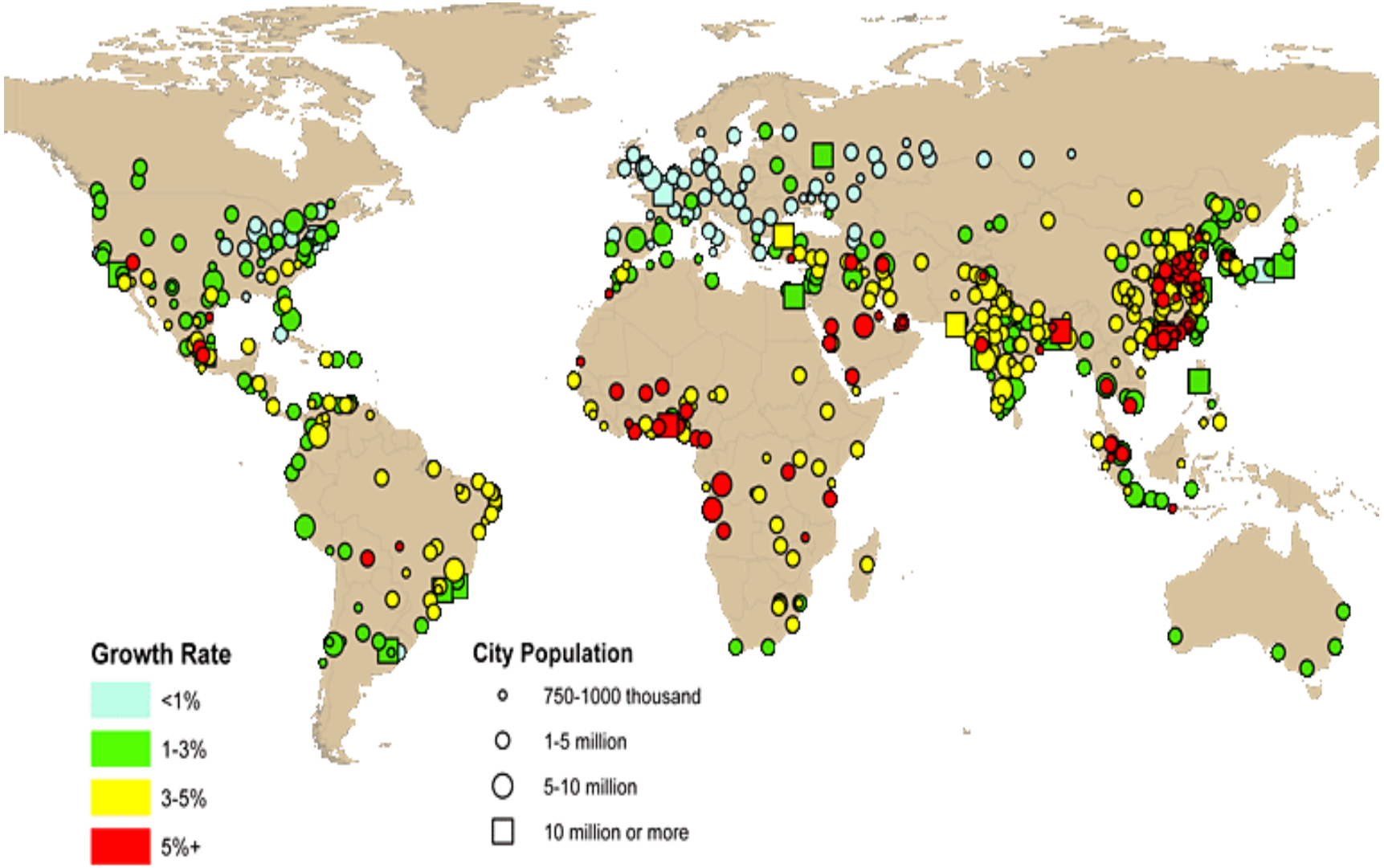
OUTLINE

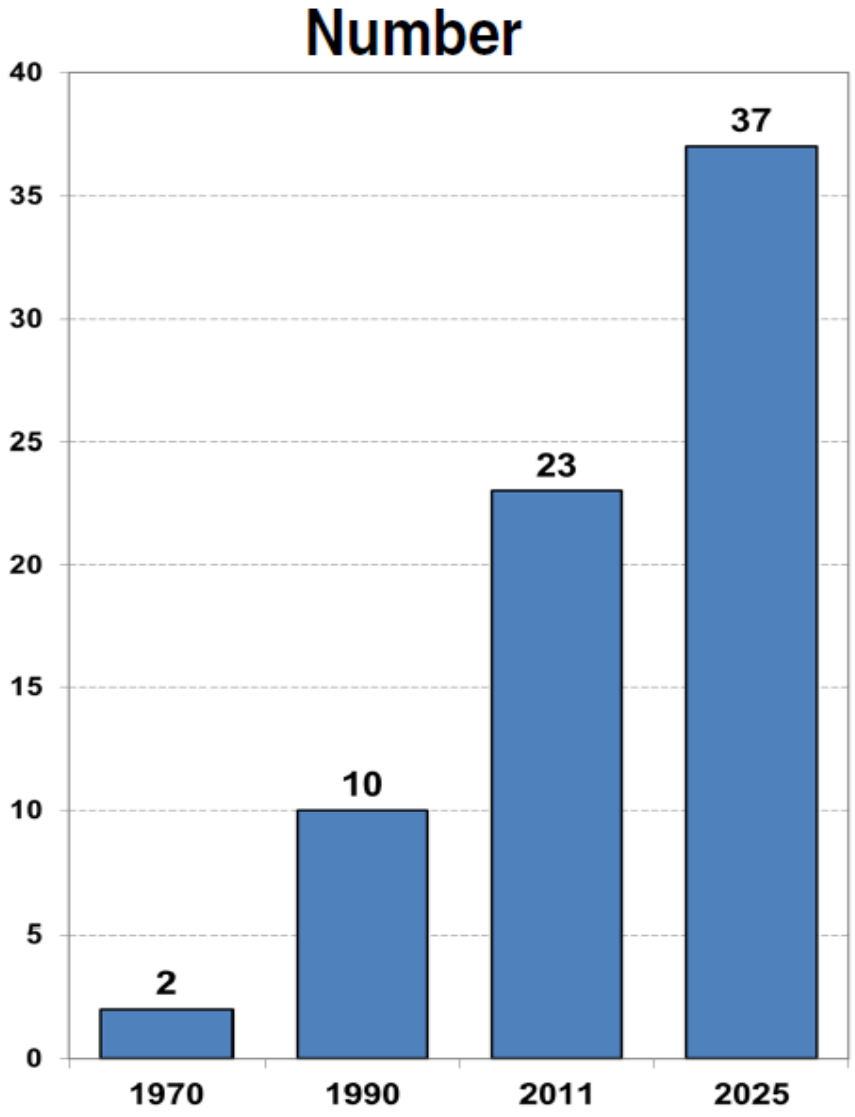
- Introduction: Urbanization around the world
- Sustainability
  - what does it mean? Sustainability indices
- Benefits and Costs of Urbanization
- Environmentally sustainable cities
  - Urban planning
  - Energy efficiency
  - Waste water
  - Retrofitting: Easy Fixes
- Financing Cities
  - Financing sustainability: three scenarios
  - Sources of finance

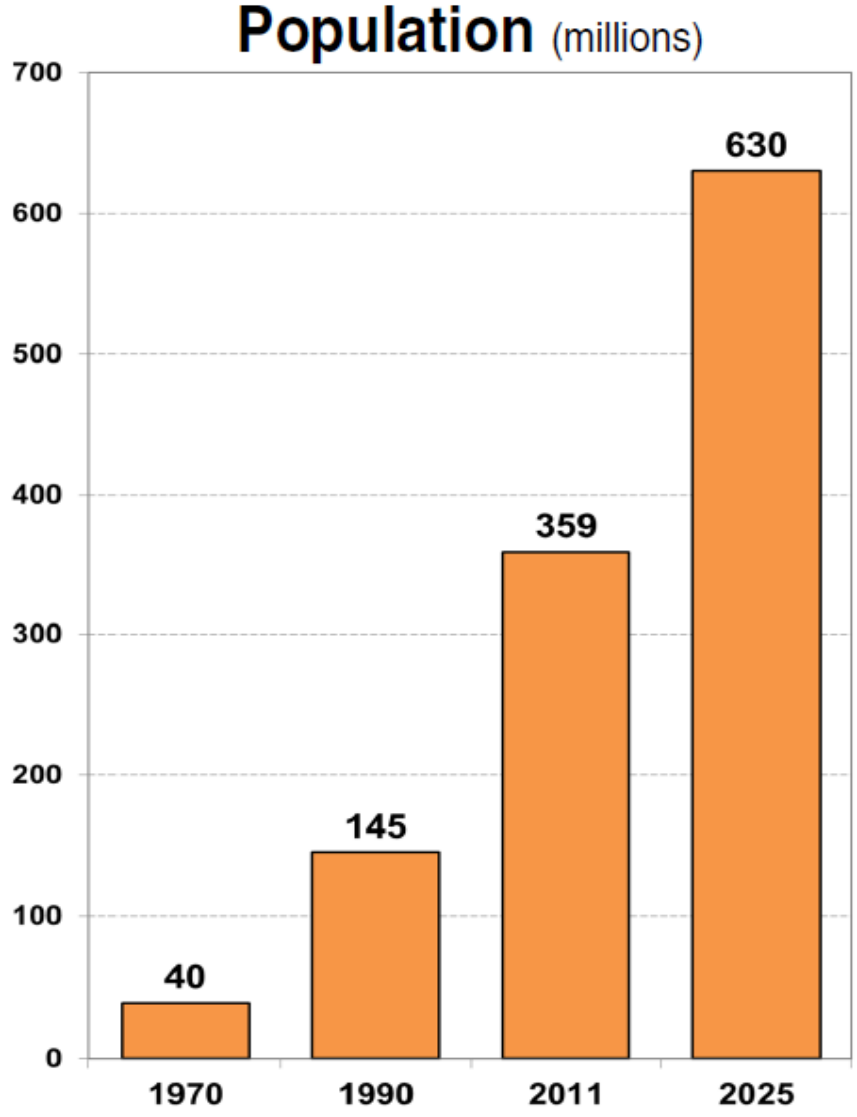
Growth Rates of Urban Agglomerations, 1970-2011

Source: United Nations, Population Division (2012). *World Urbanization Prospects 2011*

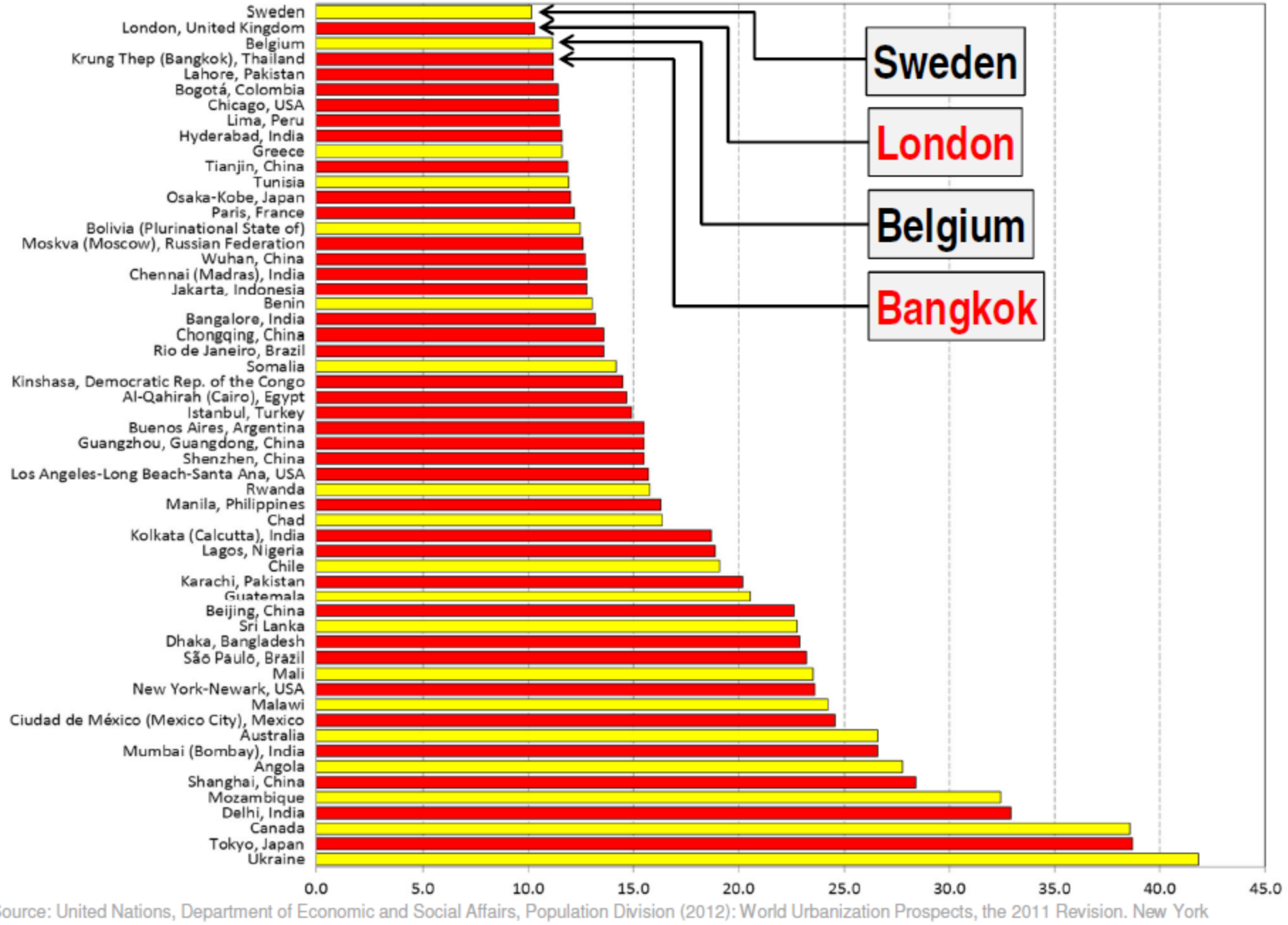


Mega-Cities (10+ million Inhabitants)



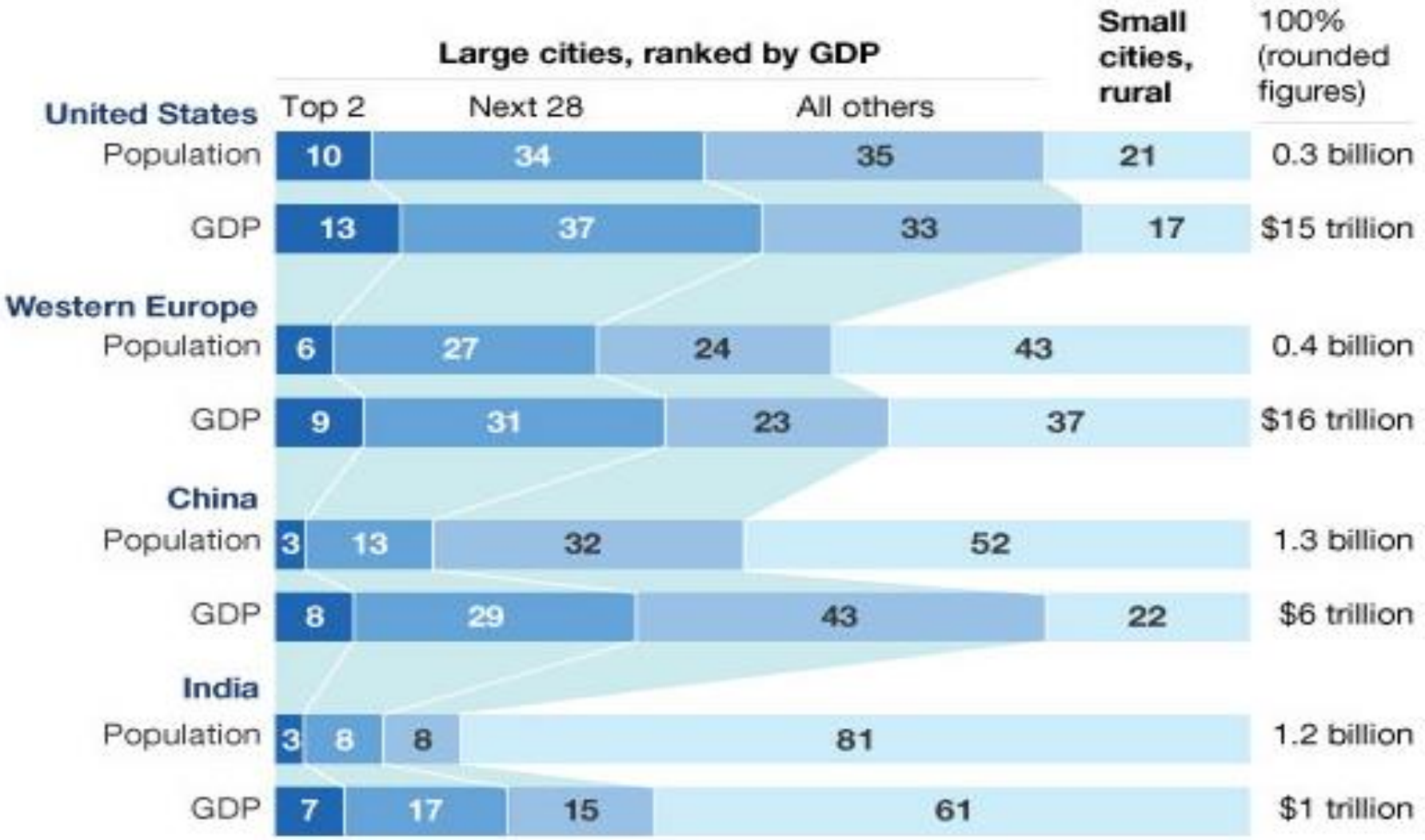


Source: United Nations, Department of Economic and Social Affairs, Population Division (2012): World Urbanization Prospects, the 2011 Revision. New York



Source: United Nations, Department of Economic and Social Affairs, Population Division (2012): World Urbanization Prospects, the 2011 Revision. New York

Cities segmented by contribution to total GDP, 2010, cumulative % of total[1]



[1]GDP measured at real exchange rate; some figures may not sum to 100%, because of rounding.
Source: McKinsey Global Institute analysis

Episodes of Urbanization

JAPAN

First specialized in labour intensive low technology goods production and then began to move up the technology chain.

THE TIGERS (HK, TW, SK, SG)

.Strategy of concentrated spatial development in urban agglomerations, Seoul/Pusan and Taipei/Kaohsing.

Export oriented and outward looking strategy. Cities as connected with the rest of world as with their hinterlands.

THE CUBS

Thailand, Indonesia and Malaysia during the 1980s.

concentrated heavy investment was repeated in the metropolitan cities of Bangkok, Jakarta and Kuala Lumpur

CHINA

Early Chinese economic and urban growth in the 1980s and 1990s was also the result of a similar strategy

Shanghai and the PRD

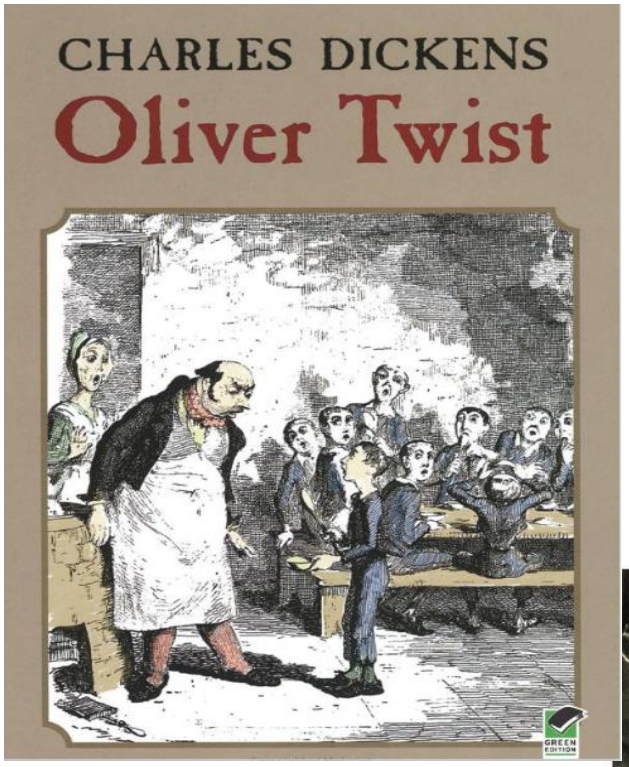
INDIA

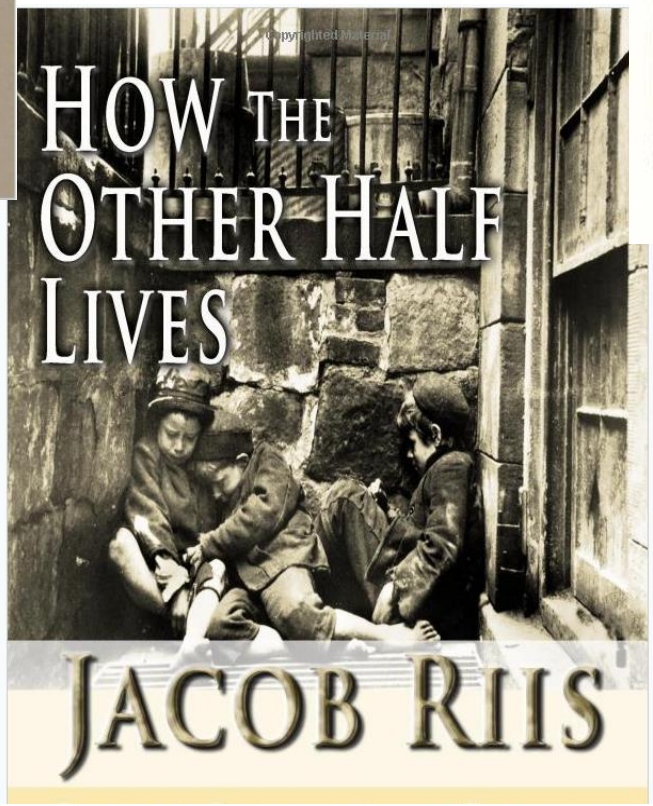
metropolitan growth – but not necessarily coastal

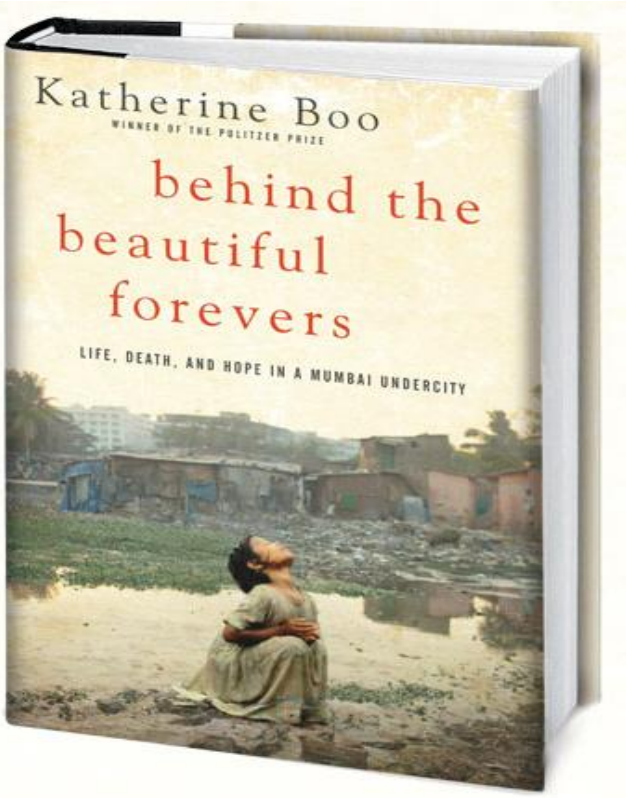
BENEFITS ?

URBANIZATION

COSTS ?

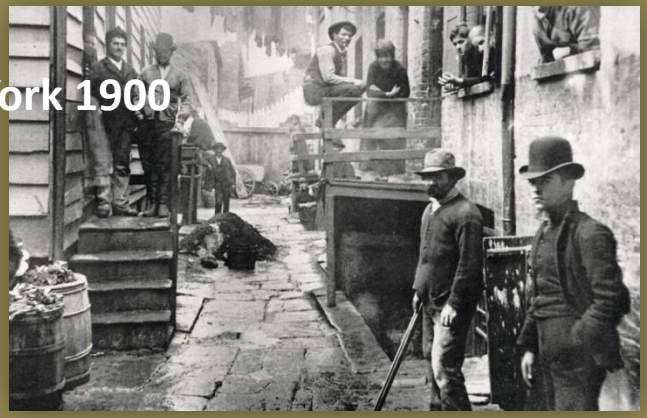

CHARLES DICKENS
Oliver Twist


HOW THE OTHER HALF LIVES
JACOB RIIS


Katherine Boo
WINNER OF THE POLITZER PRIZE
behind the beautiful forevers
LIFE, DEATH, AND HOPE IN A MUMBAI UNDERCITY

London 1840

New York 1900



Bombay 2010

Cost of Urbanization: Congestion

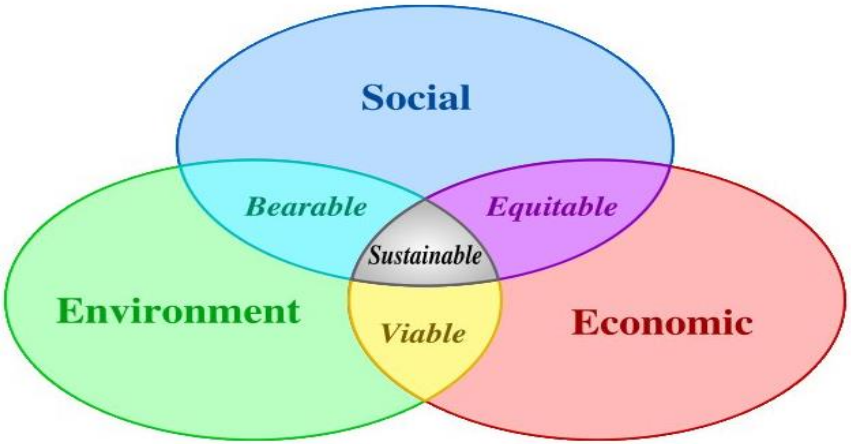
Cost of Urbanization: Waste & Environmental Challenges

Cost of Urbanization: Poor Housing

Cost of Urbanization: Air Pollution

Cost of Urbanization: Crime

SUSTAINABILITY : MEETING THE NEEDS OF THE PRESENT WITHOUT COMPROMISING THE ABILITY OF FUTURE GENERATIONS TO MEET THEIR OWN NEEDS (Brundtland Commission, 1987)

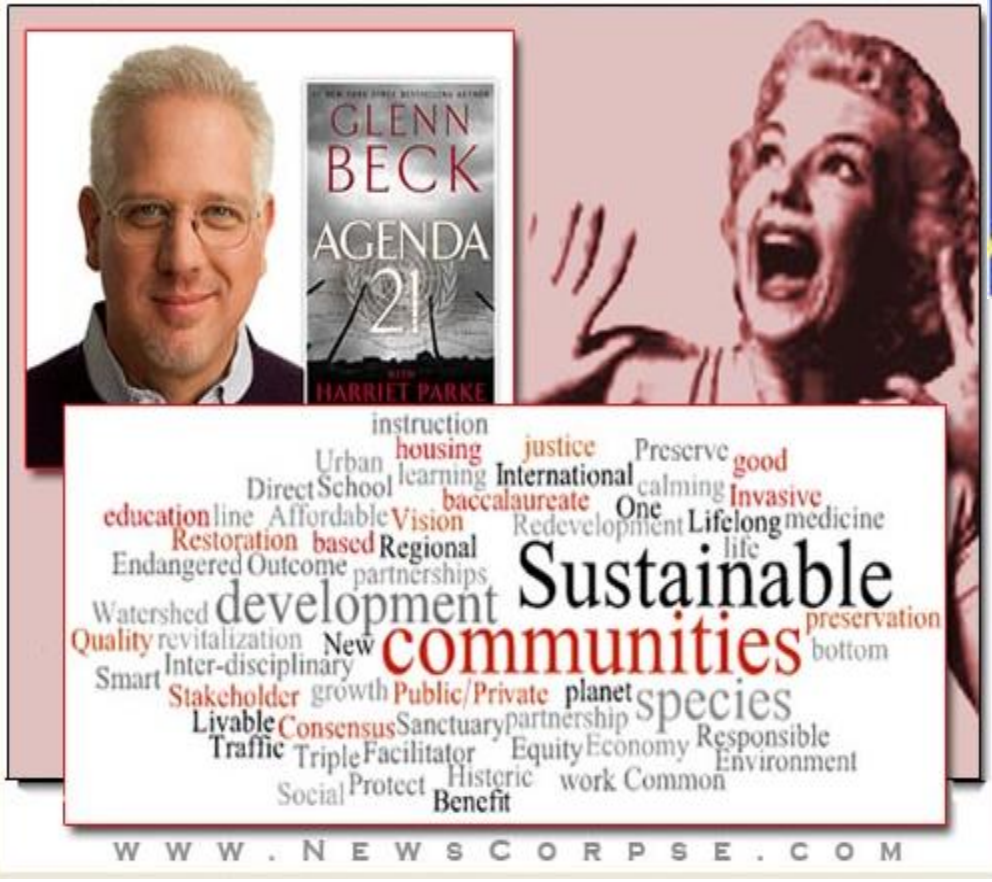


Source : Wikipedia

AGENDA 21 IS EVIL

GLENN BECK'S SCARY "AGENDA 21" KEYWORDS

PROOF OF THE UNITED NATION'S IMMINENT TAKEOVER OF AMERICA

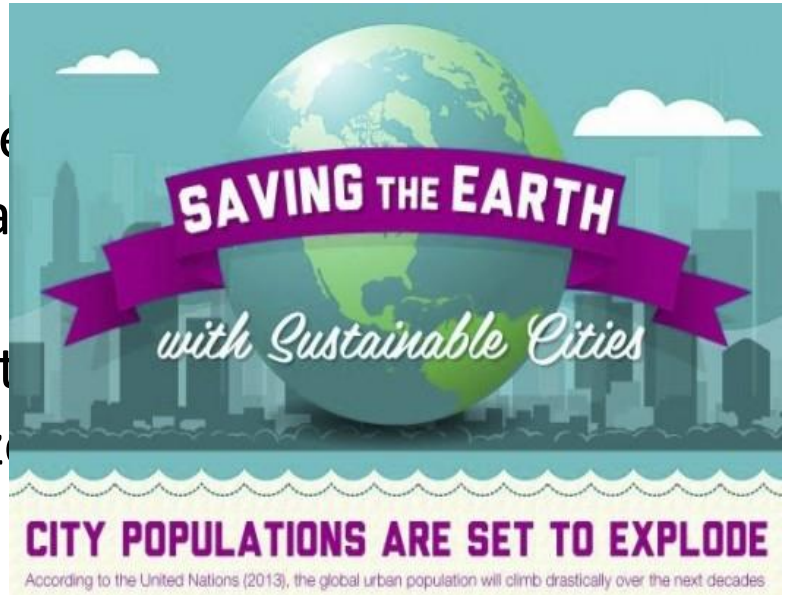


INDICATORS OF SUSTAINABILITY (McKinsey)

Categories	Definition	Indicators	Description of the indicators
Basic needs	▪ Access to safe water, living conditions, education and health services	▪ Water supply ▪ Housing ▪ Health ▪ Education	▪ Water access rate (%) ▪ Living space (sq.m per capita) ▪ Doctors per capita ▪ Student teacher ratio (primary school)
Resource efficiency	▪ Efficient use of energy, power and water; waste recycling	▪ Power ▪ Water demand ▪ Waste recycling ▪ % GDP from heavy industry	▪ Total electricity consumption (kwh per GDP) ▪ Water consumption (Liters per capita) ▪ Rate of industrial waste recycled and utilized (%) ▪ Heavy industry GDP/ Total GDP (bln RMB)
Environmental cleanliness	▪ Clean air and water ▪ Waste management	▪ Air pollution ▪ Industrial pollution ▪ Waste water treatment ▪ Waste management	▪ Concentration of SOx, NOx, PM10 (mg/cu.m) ▪ Industrial SO2 discharged per GDP (T/ RMB) ▪ Wastewater treatment rate (%) ▪ Domestic waste collected & transported (10,000 T per capita)
Built environment	▪ Dense, transit-oriented, green, efficient design	▪ Urban density ▪ Mass transit usage ▪ Public green space ▪ Building efficiency	▪ Persons per square kilometer of urban area ▪ Passengers using public transit (bus, trolley) ▪ Public green space per capita (sq.m per capita) ▪ Building heating efficiency
Commitment to future sustainability	▪ Investment in human and physical assets	▪ Green jobs ▪ Investment on environmental protection	▪ # of environmental professionals per capita ▪ Amount of environmental sanitation funds per GDP

Livable and resilient cities are …

- among the most energy-efficient.
- Built-up areas are compact. Street networks are dense and interconnected;
- High densities of buildings, jobs, urban amenities and social infrastructures;
- Public transit modality and capacity match with urban density, land use and social infrastructure;
- Main urban amenities such as schools, green spaces or transit are accessible by walking;
- Urban blocks are small sized and buildings are aligned along the stree allowing internal gardens & courtya Streets promote walking;
- The urban fabric—buildings & street is designed and oriented to optimiz bioclimatic potential.



Source: World Bank ESMAP

Changes in urban forms are influenced by technological choices for transportation, land value, and urban development policies.

- **Transportation technologies are a key driver of urban transformation.**

The urban extension of a city is directly correlated to the average distance that can be travelled in one hour. The improvement of traffic speed may thus encourage urban sprawl. New technologies and infrastructures for transport may dramatically change the spatial distribution of land use, densities and activities within the city.

- **Land value drives the rate of conversion of rural land into urban land.**

The improvement of transport technologies and infrastructures makes cheaper rural land accessible. Hence, it allows its conversion into urban land and increases the area available for urbanization. Without land value control, market forces naturally drive cities towards urban sprawl.

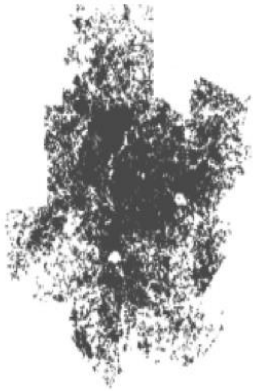
- **Urban development policies and infrastructure investments**

are responsible for land use, size of blocks and plot subdivision, the structure and hierarchy of the road networks and street patterns, and the spatial distribution of urban amenities.

- **Urban forms greatly affect energy use in urban transport and in the built environment**

Box 1: Sprawl vs. Compact Cities

often cited example of urban sprawl is Atlanta, which has a similar population as Barcelona but occupie
n area which is 26 time as large (Bertaud & Richardson, 2004)



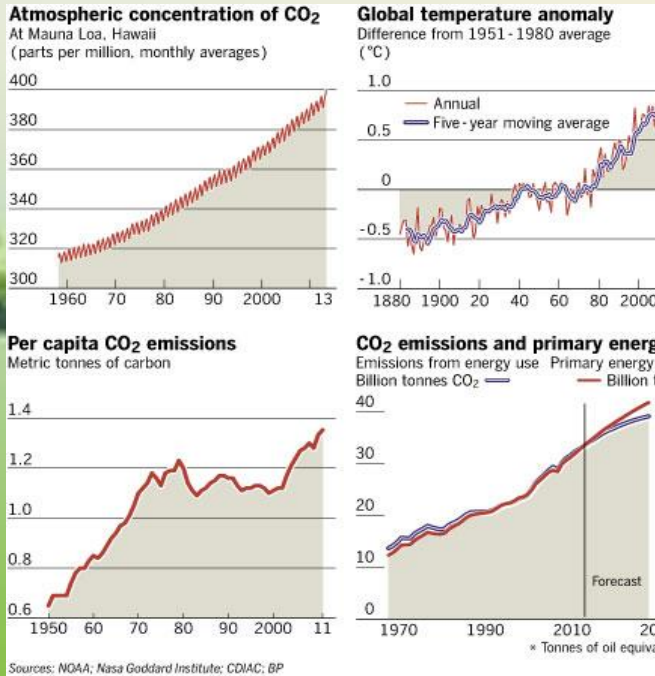
	Atlanta	Barcelona
Urban population (million inhabitants)	2.5	2.8
Urban area (km^2)	4,280	162
Urban density (pph)	6	173
Energy consumption per capita for private transportation (MJoules) [5]	80	9

Environmentally Sustainable Cities

- How to feed, house and transport urban population in ecologically sound ways?
- First, using less energy and emitting less carbon dioxide per household
- But it is not enough to be green. Cities also need to be sustainable.
- Sustainability must be built into city infrastructure from the start.
- Retrofitting is less costly than rebuilding cities from scratch

Global warming → increasing energy efficiency and reducing greenhouse gas emissions

Transportation systems:
Electric cars;
compressed natural gas



Energy Saving Opportunities in Cities

End-use sector	Key opportunities	Technical energy efficiency
Residential, public and commercial buildings	New buildings designed to minimize active energy use	Use up to 90% less active energy than typical new buildings do
	Whole building retrofit aimed at minimizing active energy use	Save up to 90% of the thermal energy use in existing buildings
	High efficiency office equipment and appliances	Use 5-90% less energy than current models
Transport	Cities designed to promote public transport, walking and bicycling	Substantial compared with the use of private motor vehicles.
	Passenger light-duty vehicles	40-67% fuel efficiency gain by 2035
	Freight trucks	30-50% fuel efficiency gain by 2035
Municipal services	Water and sanitation	5-25% or more system-wide energy savings depending on system
	Public lighting	Up to 85% energy savings compared with incumbent technologies

Sources: a. World Energy Outlook 2012, International Energy Agency;
b. Primer on Energy Efficiency for Municipal Water and Wastewater Utilities, 2011, ESMAP; and
c. Lighting the Clean Revolution, 2012, the Climate Group.

WATER CONSERVATION

1. incentives to curb water use:
- rebates for installing rainwater-harvesting systems
- water-conserving toilets.
- Systems detecting and controlling leaks in waterworks
- (Tokyo world leader)

2. access to safe drinking water and sanitation services (or
dwellers live in slums, vulnerable to cholera and waterborn

WASTE MANAGEMENT

e.g., leftover waste flows into "biodigesters" [Capturing me
landfills is cheapest ways to cut down on greenhouse gas e

EASY FIXES

SMART PARKING

Digital parking meters tell mobile-phone and navigation apps when a space opens up, reducing traffic caused by drivers trolling for spaces (San Francisco)

UNDERGROUND TRANSPORTATION

Commuter trains, subways and primary roads run underground in massive tunnels, freeing the ground level for easy, clean bike and pedestrian traffic (Portland, Ore.)

BIKE RACKS AND LANES

Ample bike lanes and racks encourage more people to ride instead of drive; they also promote fitness (Minneapolis)

EASY FIXES

WAVE POWER

Hinged cylinders anchored in the seafloor are pushed by waves, turning onshore turbines that create electricity

(Orkney, Scotland)

STORM-SURGE GATES

Open gates in rivers, estuaries and canals close when storm surges are expected, to protect low-lying and subterranean infrastructure

(Rotterdam; London)

SOUR FILMS

Photovoltaic sheets on south-facing building facades generate electricity

(Berlin)

EASY FIXES

UNDERWATER TURBINES

Turbines seated on the seafloor or estuary bed are spun by daily tides, generating electricity (New York City)

SOLAR POWER

Panels generate electricity instead of power plants and also shade rooftops to lower a building's cooling needs

(Redlands, Calif.)

HIGH-EFFICIENCY WINDOWS

Superinsulated windows quadruple the thermal performance of double panes and can be made from the glass in existing windows (Empire State Building, New York)

EASY FIXES

CARBON-SEQUESTERING CONCRETE

Construction material made locally with carbon dioxide that is exhaled by power plants could reduce greenhouse gas emissions

(Under development)

VERTICAL FARMS

Food grown indoors could reduce fertilizer and freshwater use, shorten transport and recycle gray water otherwise dumped by treatment plants

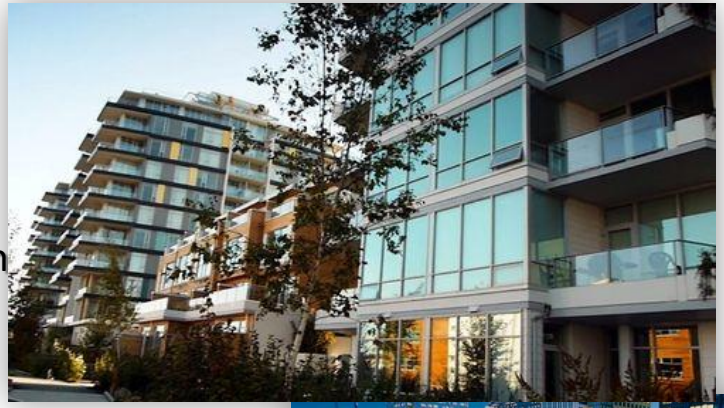
(Under development)

STORM-WATER PRICING

Taxing property owners on the volume of storm water that runs off their property promotes retrofits that reduce wastewater volume at treatment plants

(Philadelphia)

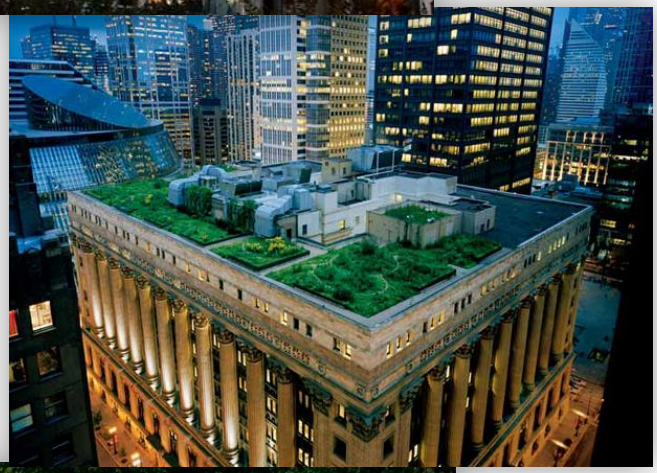
EASY FIXES



LEED NEIGHBORHOOD

Residential and commercial construction done across a city region to the highest green, or Leadership in Energy and Environmental Design (LEED), standards saves energy, materials and emissions

(Rockville, Md.)



GREEN ROOFS

Rooftop vegetation insulates buildings against heat and cold and absorbs storm water

(Chicago)

WHITE ROOFTOPS

Rooftops painted white reflect heat, lowering a building's cooling cost and a city's heat buildup

(Washington, D.C.)

EASY FIXES

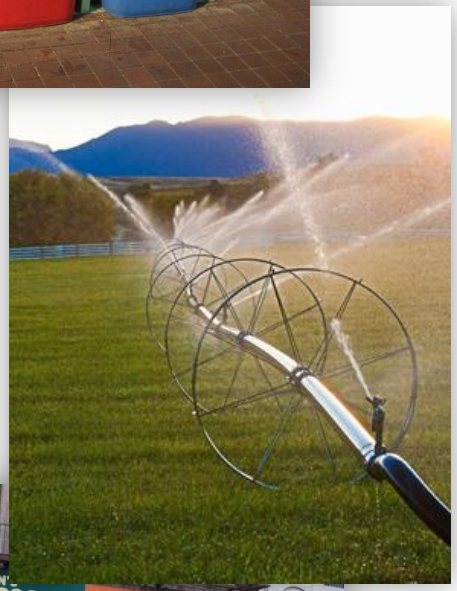
THREE-BIN RECYCLING

Requiring businesses and homes to separate trash, recyclables and compost spares landfills; collection charges drop as trash drops
(San Francisco; German cities)

SATELLITE IRRIGATION

Satellite control of park and lawn irrigation systems cuts water consumption and pumping power

(Los Angeles)



HYBRID TAXIS

Large portions of taxi fleets converted to hybrid vehicles reduce air pollution and greenhouse gas emissions

(San Francisco; New York City)

Financing Cities:

Mobilizing finance:

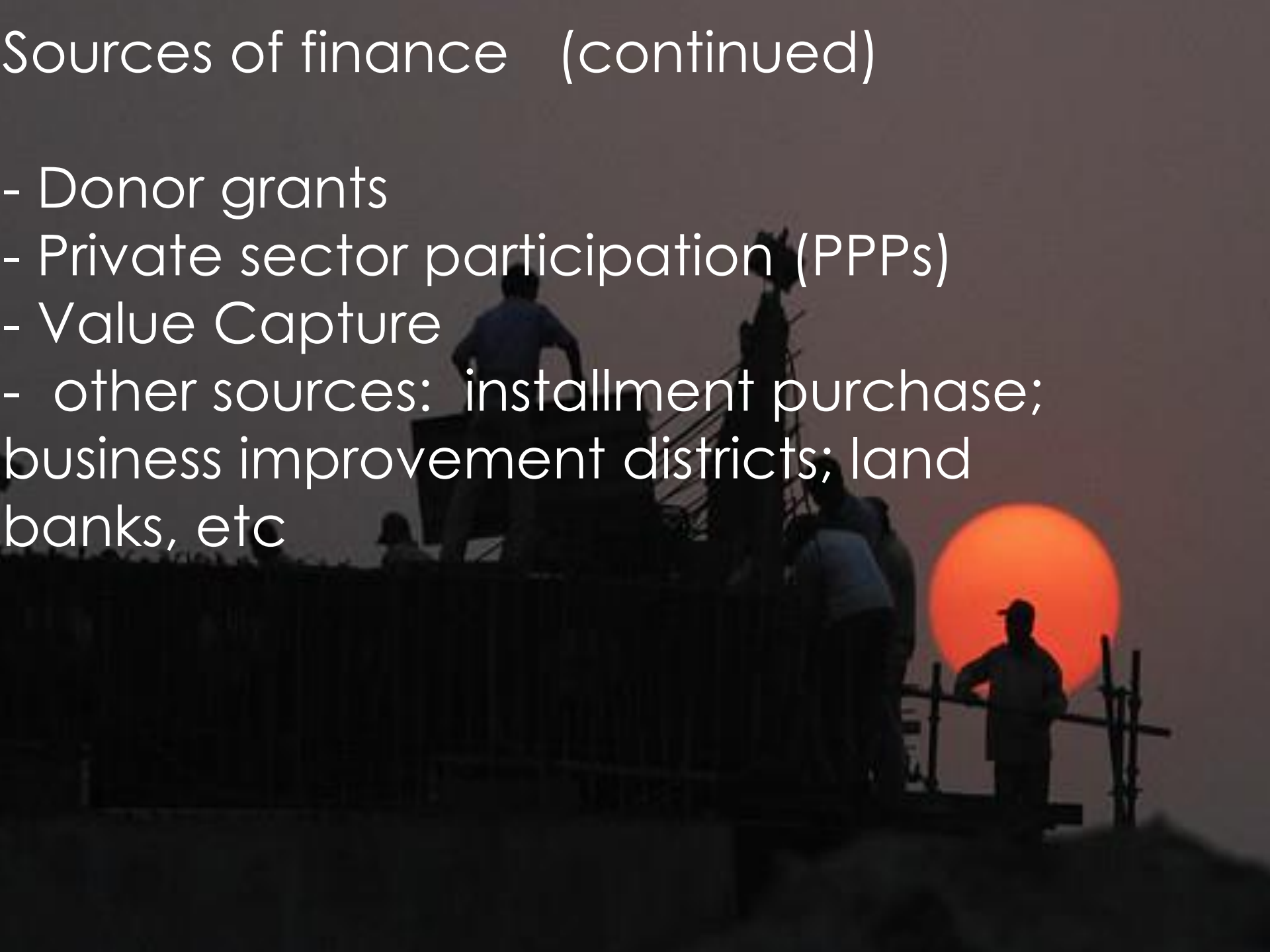
three scenarios

1. Mature debt markets but weak devolution framework
2. Constrained debt markets but successful devolution
3. Mature markets and devolution secured


Sources of finance
- Budget
- Loans
- Balance sheet financing

Sources of finance (continued)

- Donor grants
- Private sector participation (PPPs)
- Value Capture
- other sources: installment purchase; business improvement districts; land banks, etc




Thank you