World Urban Development and Energy

Critical Issues for the 21st Century

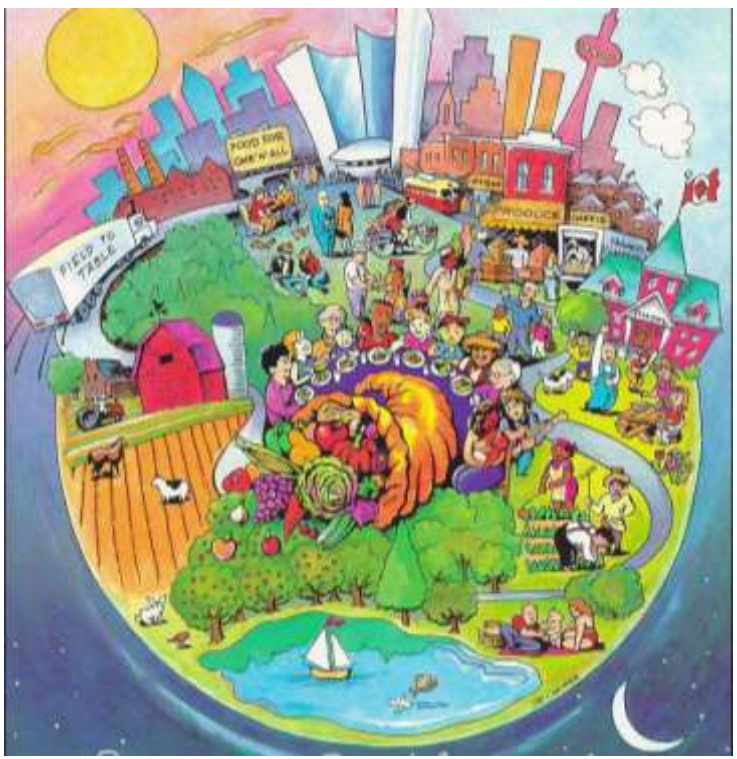
Presentation at the ULI/Citistates Bellagio Summit 2012
July 31

Eugenie L. Birch
Nussdorf Professor of Urban Research
Department of City and Regional Planning
PennDesign

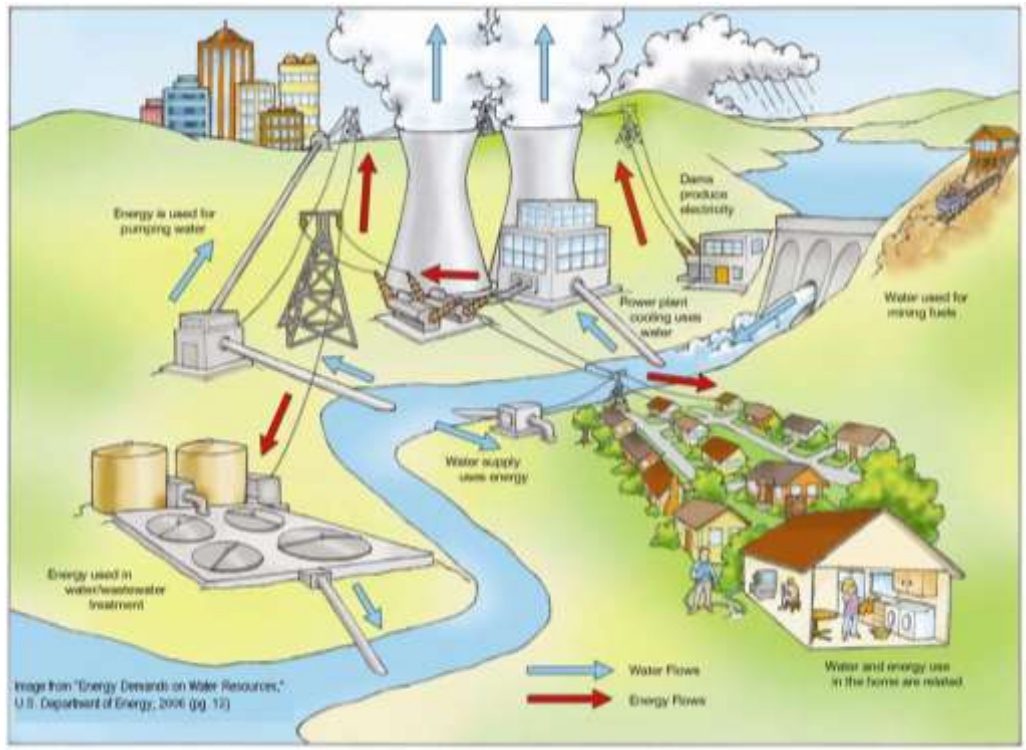
Co-Director, Penn Institute for Urban Research
University of Pennsylvania

Energy and Basic Urban Needs

Food and Energy Nexus



Water and Energy Nexus

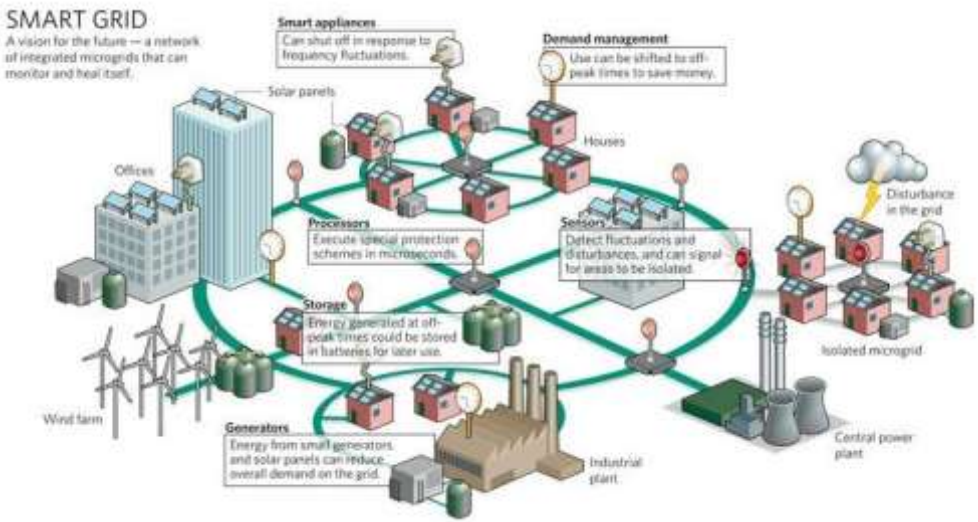


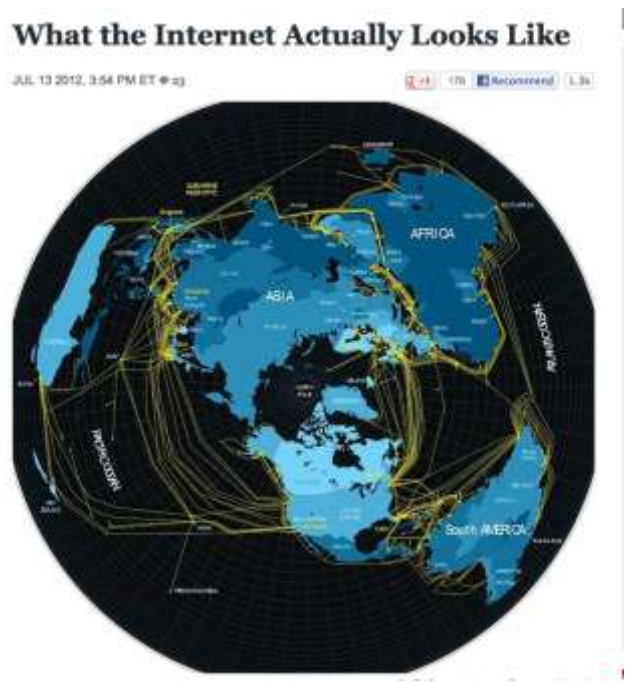
Energy and Urban Building

"Poor countries will have to build the equivalent of a city of a million each week for at least forty years…." Joel Cohen, in Birch and Wachter*, Global Urbanization* (2011)

Energy and Urban Transport

Energy and Urban Technology

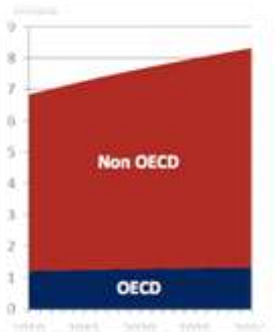




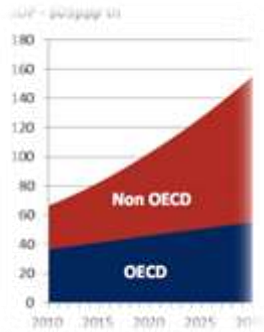
Topics to be covered

- Drivers of energy demand
- Sources of concern about energy
- Scenarios
- Electricity and fuels
- Investment
- What does this mean for cities?

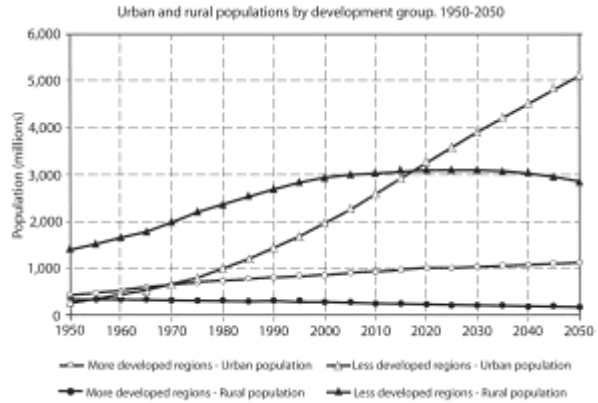
Drivers of Energy Demand



+



+

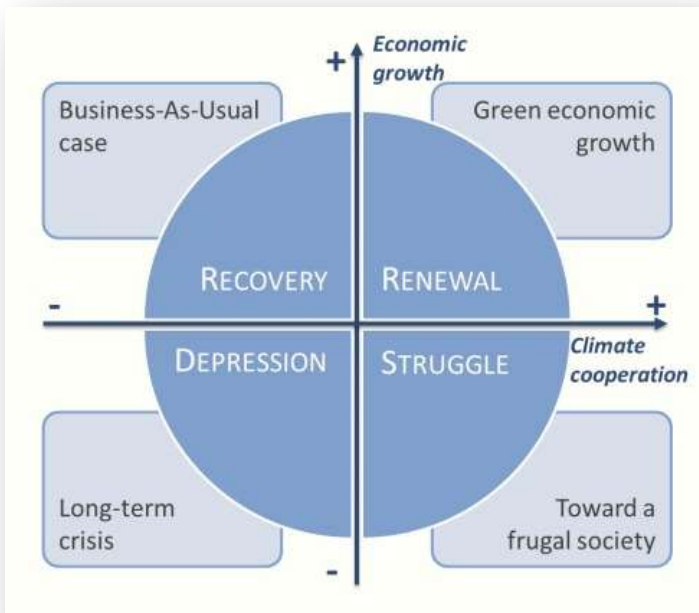


=

Population + GDP + ***Level of urbanization***

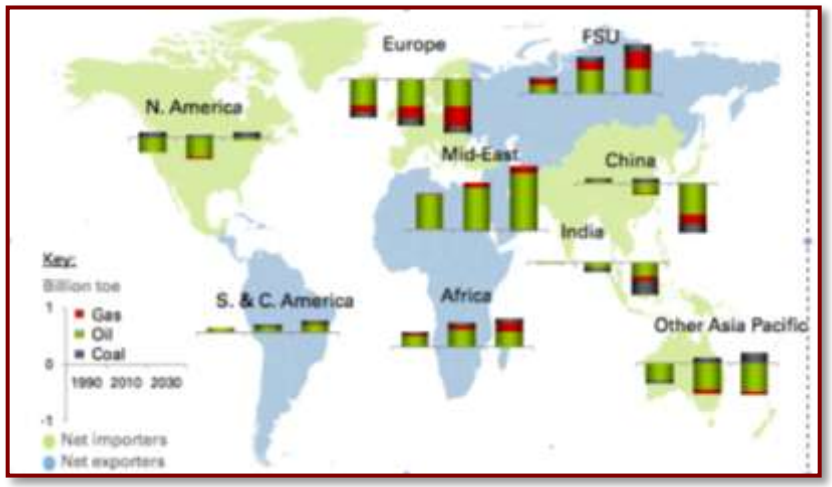
Scenarios:

IEA (OECD)
US DOE
Industry
Data firms



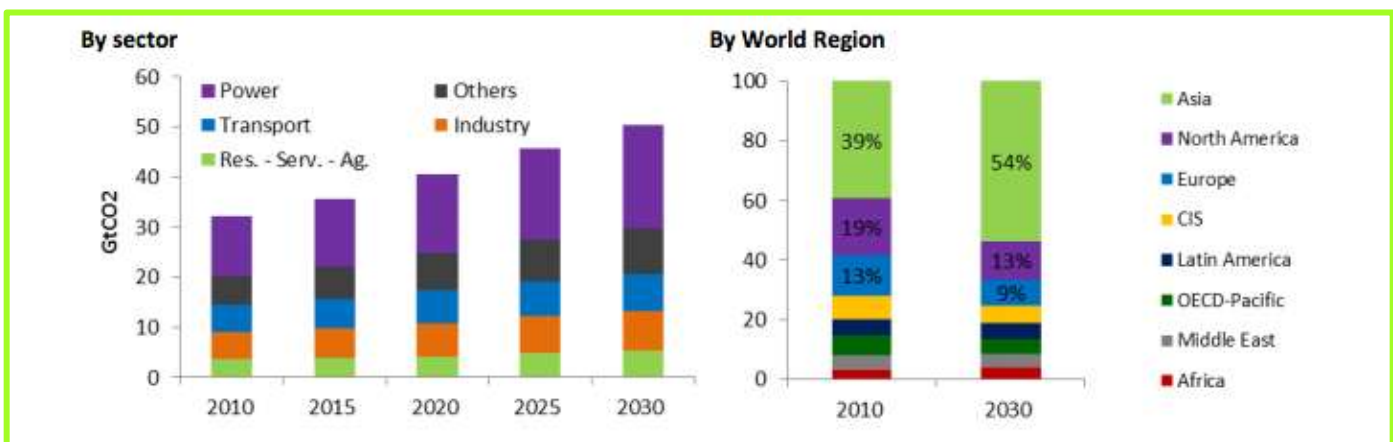
Source: Enerdata November 2011

Sources of Concern about Energy



Energy Security: Economic Competitiveness/ Resource Depletion

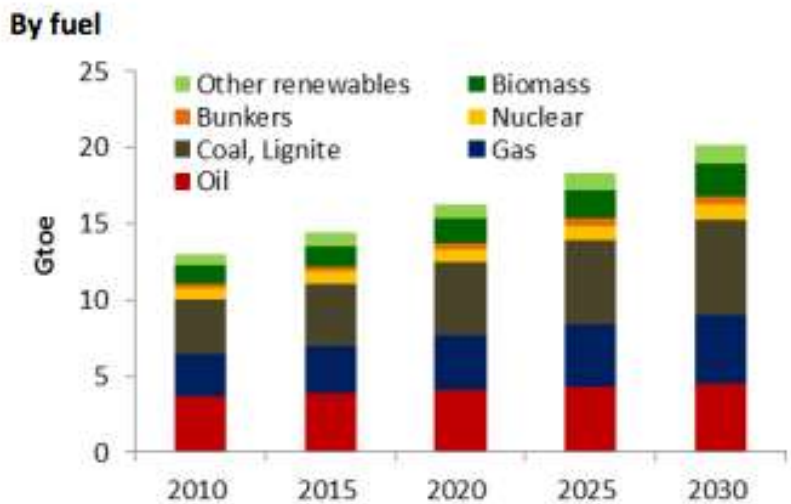
Equity: "Energy Poverty," Energy Transition, Health

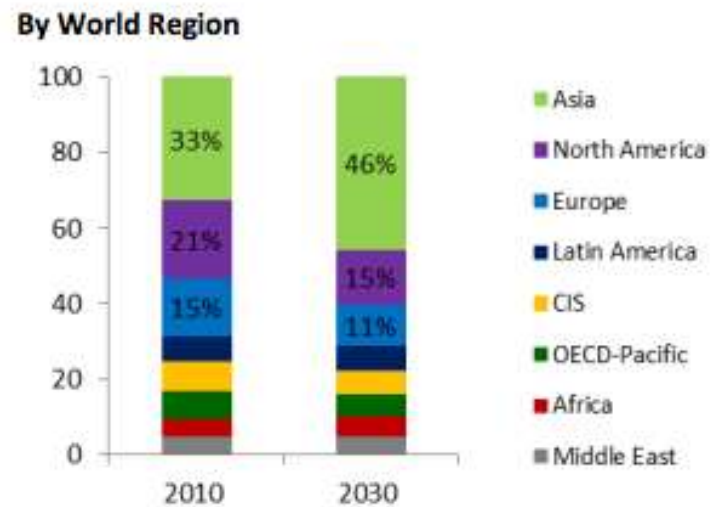


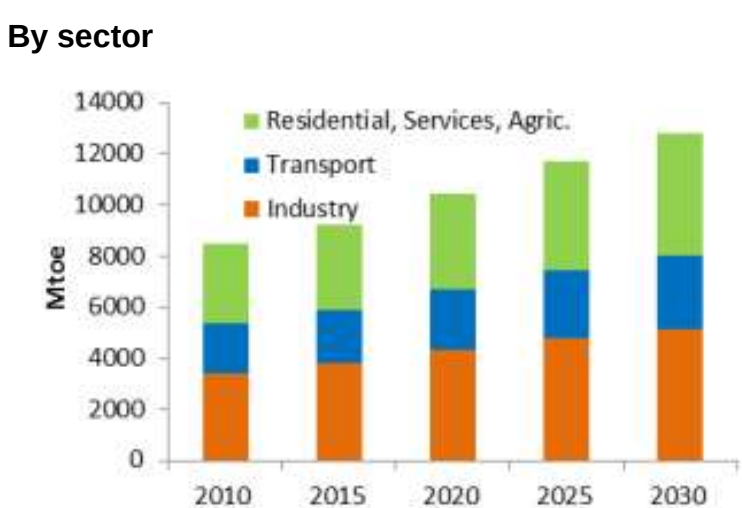
Climate Change: CO_2 emissions, global warming

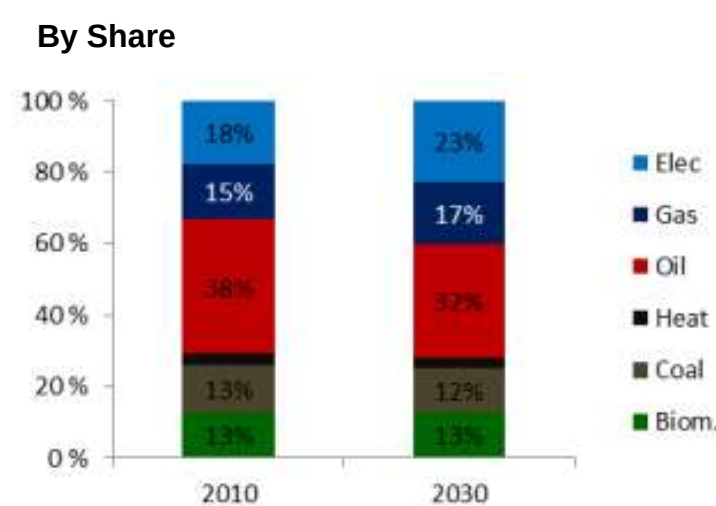
Sources and location of CO_2 Emissions

RECOVERY SCENARIO: Medium estimate – no new policies implemented





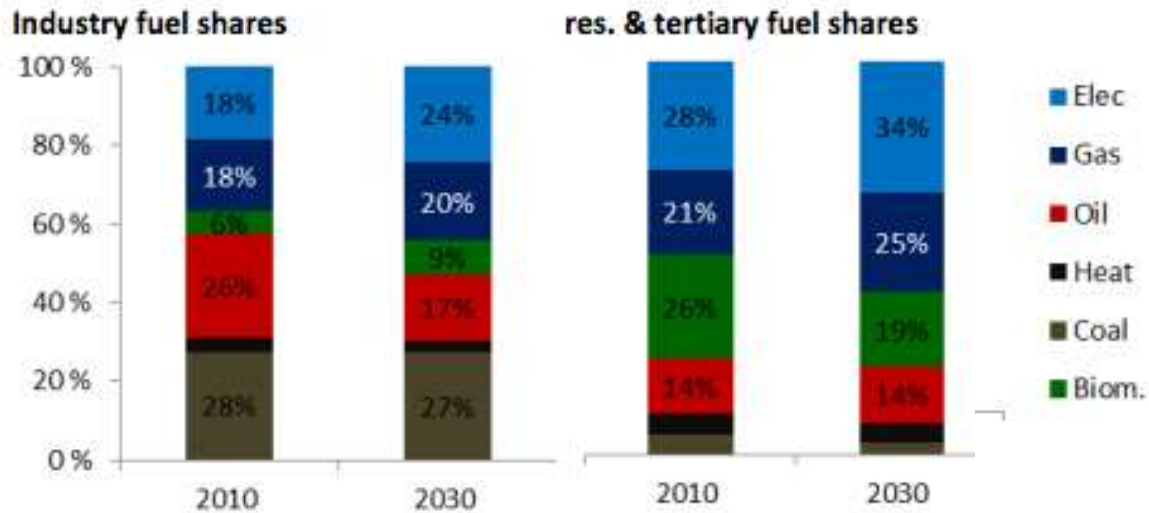




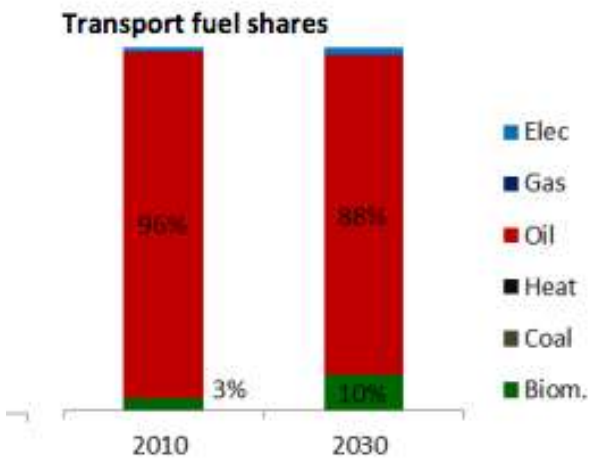
Demand +2.2% annually: GTOE 14-20; 90 % of new demand from emerging economies

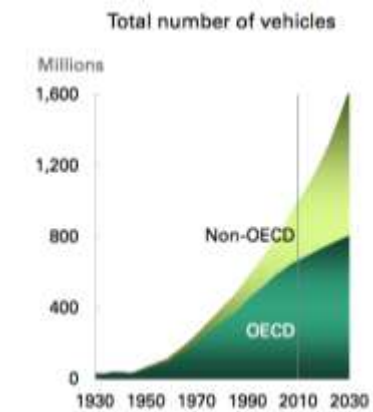
Energy Types and Fuel Sources

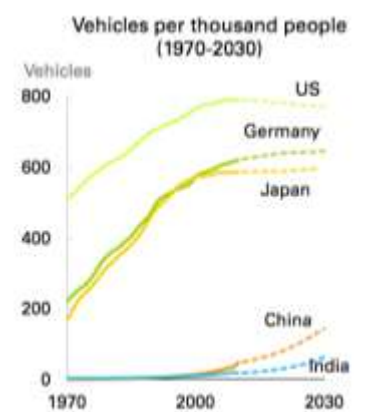
Power
Electricity



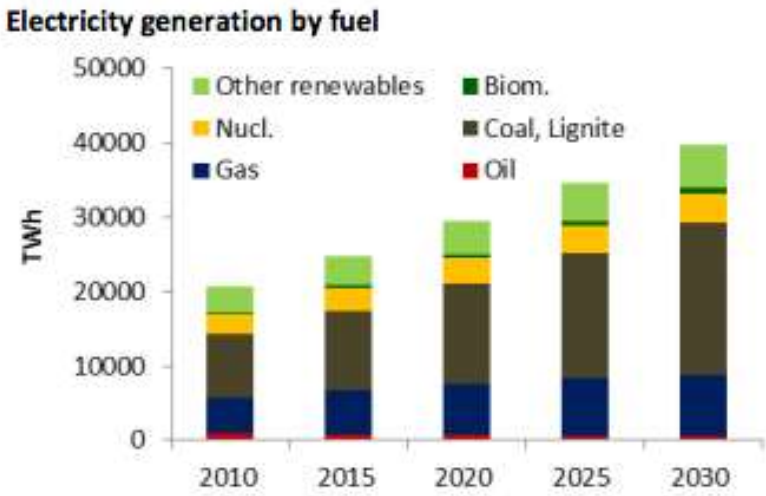
Transport
Oil

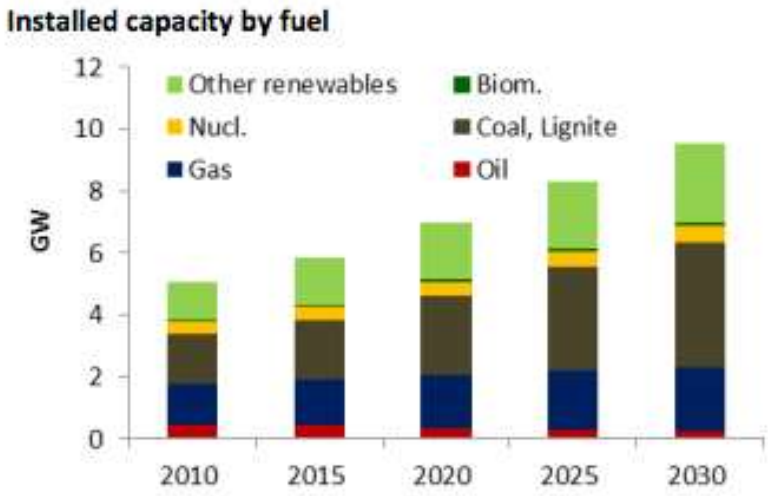






Electricity and Fuels





TOTAL GENERATION 2030

Fossil fuels: 71% of total; natural gas is key/many issues

Nuclear: 10%

Renewables: 20%

INSTALLED CAPACITY 2030

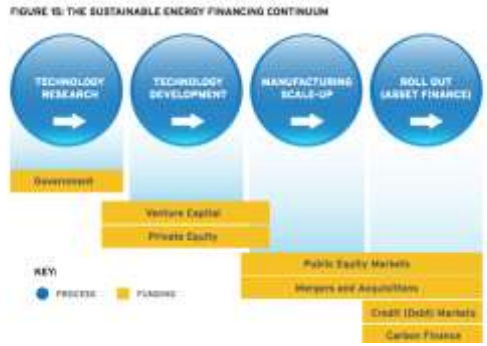
Fossil Fuels: increases in coal: China 50- 60%; India 15%;

Nuclear: under 10% of total; China, S. Korea lead increase

Renewables: wind and hydro important/ doubles but share stays same

Investments Who, What, When

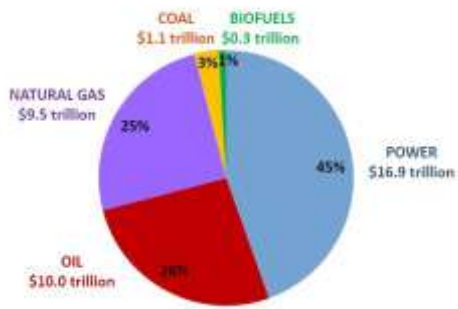
Process: Government to Private Equity



Energy-supply Infrastructure
$38 Trillion next decades
or $1.7 Trillion/year

(Source: International Energy Agency 2011)

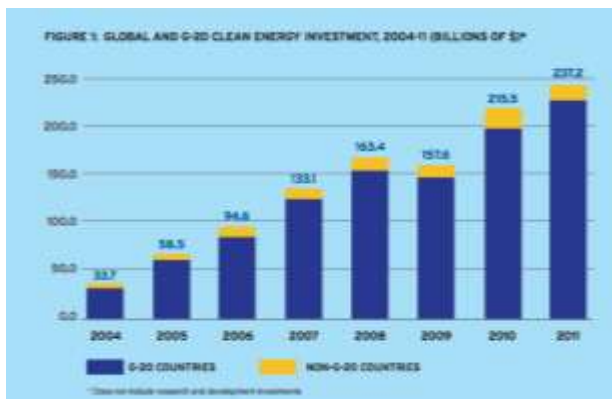
Cumulative investment in energy infrastructure, *2011-2035*

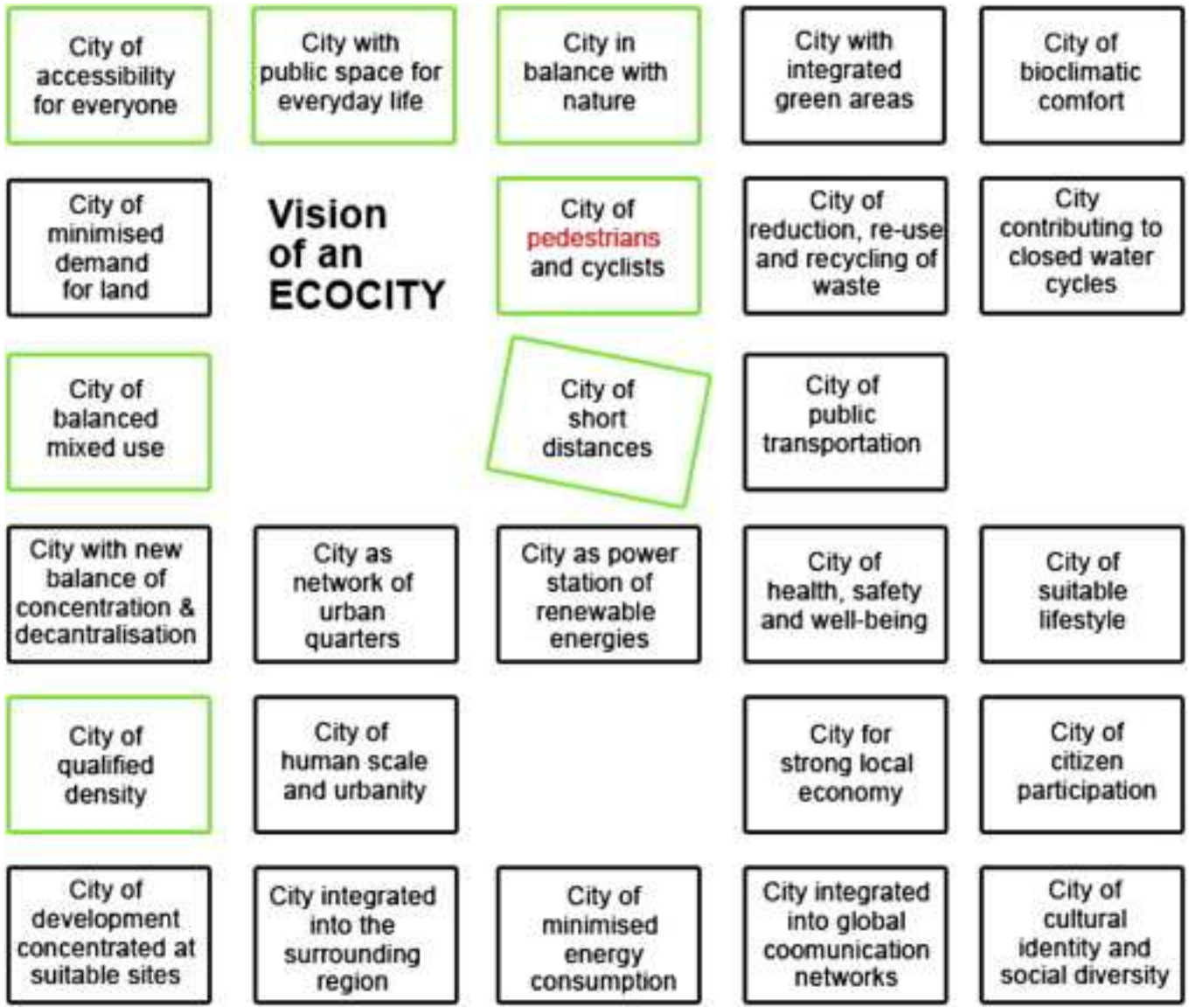


Clean Energy Investments 2011
$237 Billion

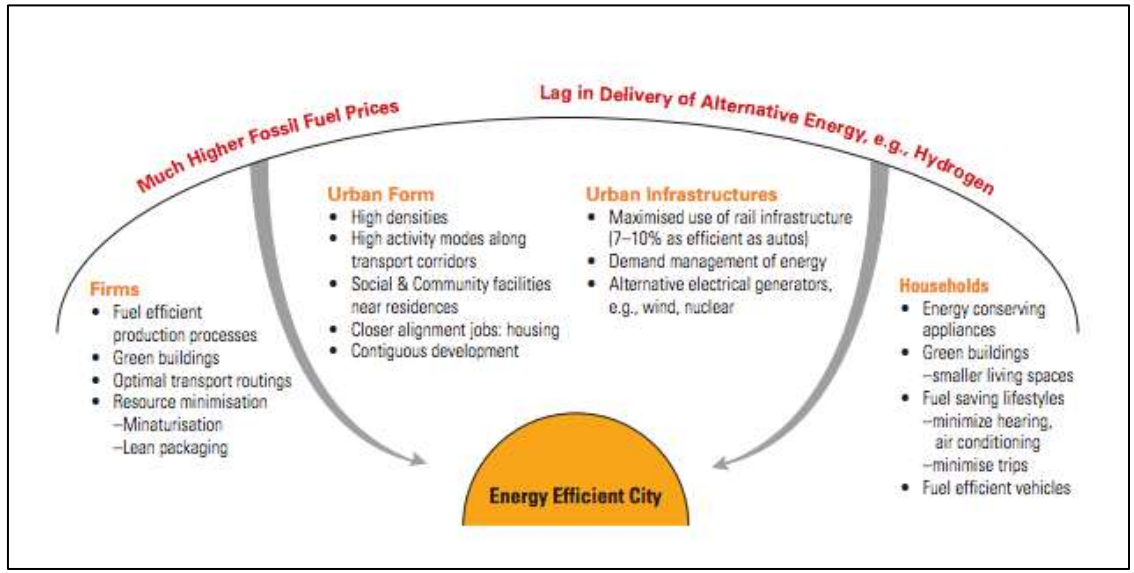
US, China, Germany, India

(Source: Pew Charitable Trust)

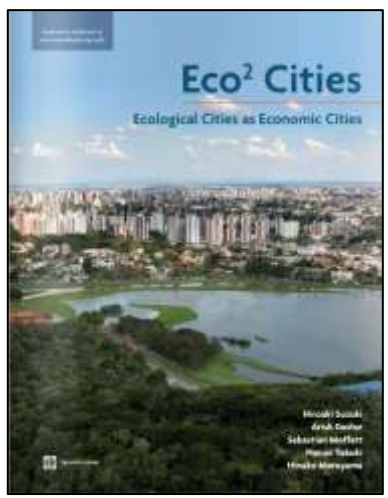


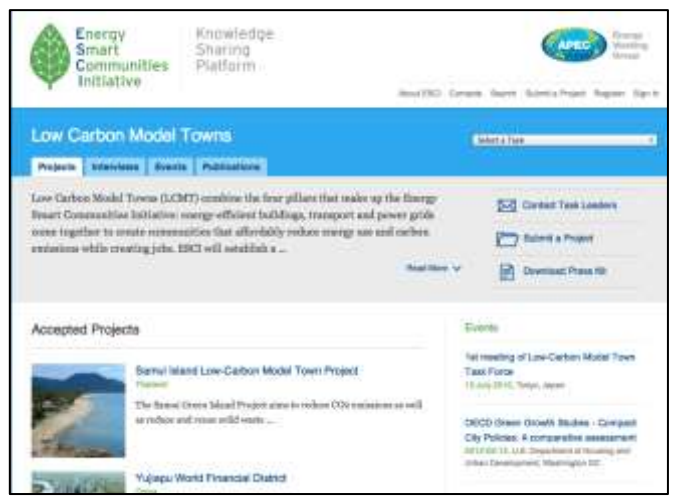

City of accessibility for everyone
City with public space for everyday life
City in balance with nature
City with integrated green areas
City of bioclimatic comfort
City of minimised demand for land
Vision of an ECOCITY
City of pedestrians and cyclists
City of reduction, re-use and recycling of waste
City contributing to closed water cycles
City of balanced mixed use
City of short distances
City of public transportation
City with new balance of concentration & decantralisation
City as network of urban quarters
City as power station of renewable energies
City of health, safety and well-being
City of suitable lifestyle
City of qualified density
City of human scale and urbanity
City for strong local economy
City of citizen participation
City of development concentrated at suitable sites
City integrated into the surrounding region
City of minimised energy consumption
City integrated into global coomunication networks
City of cultural identity and social diversity

What does this mean for cities?



Source: Cities Alliance, *Guide to City Development Strategies Improving Urban Performance* 2006





Urban Development and Energy

LAND	POWER	TRANSPORT	BEHAVIOR
	Generation (Types)	Mode (mass/ individual)	
	Distribution	Fuel Types	
	Consumption/Uses (efficiencies)	Functions/Routes	
	New technologies (e.g. Smart grid)	Innovations (BRT,	
	Finance and management	Finance and mangement	
ENERGY			