Sustainable innovation for international growth:

student capital is the future

Keynote Address

Politecnico di Milano

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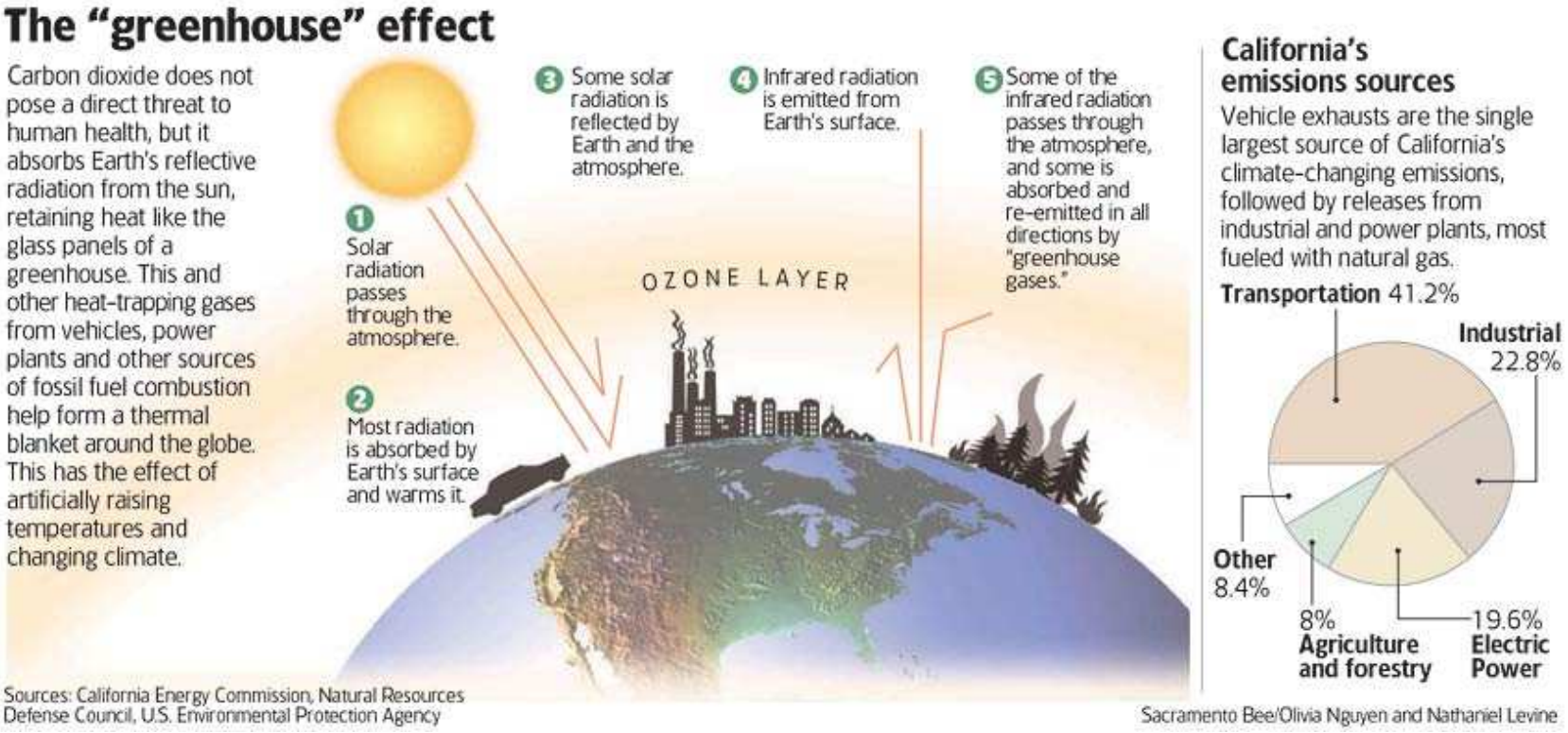
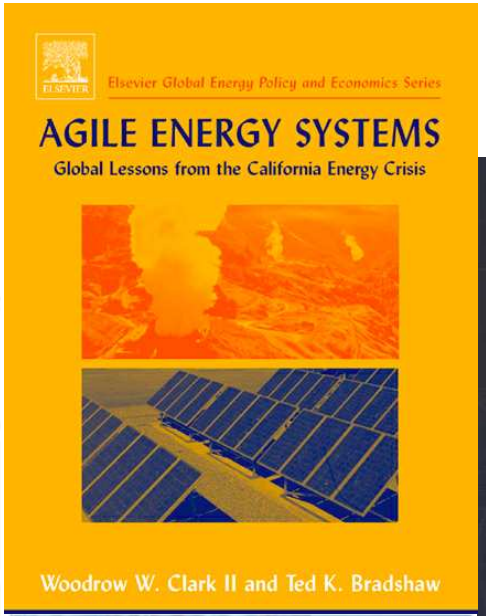
Qualitative Economist

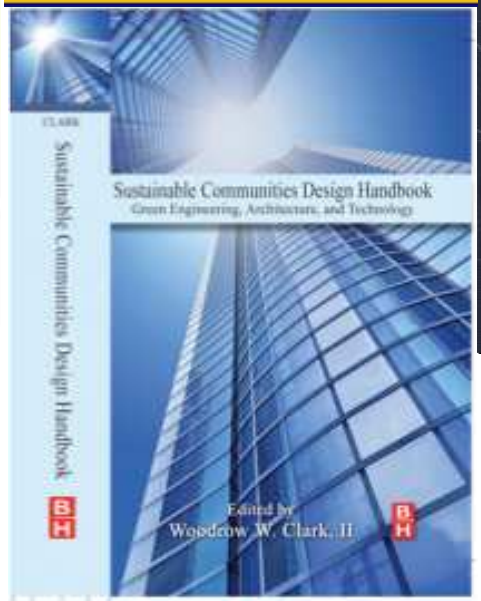
POLITECNICO DI MILANO

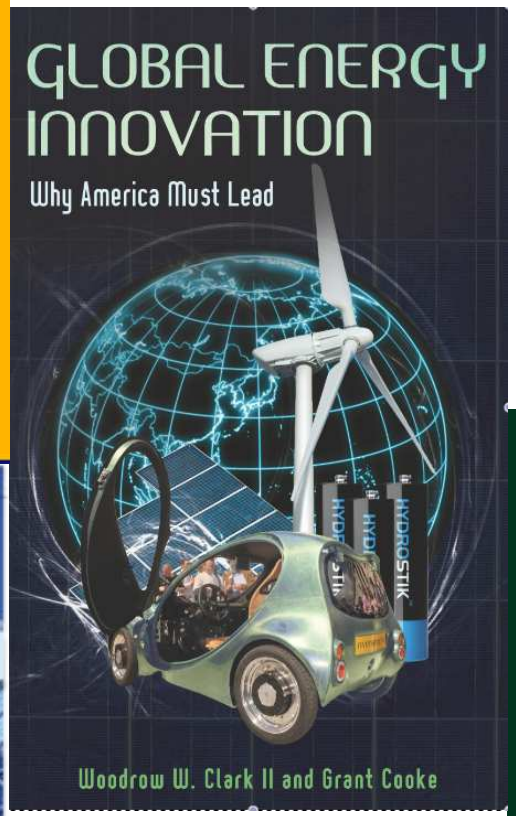
THE WORLD IS ROUND

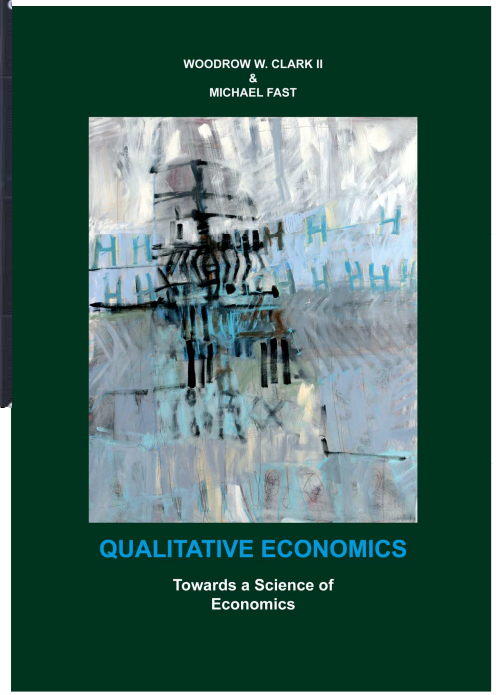


Sustainable Green Communities

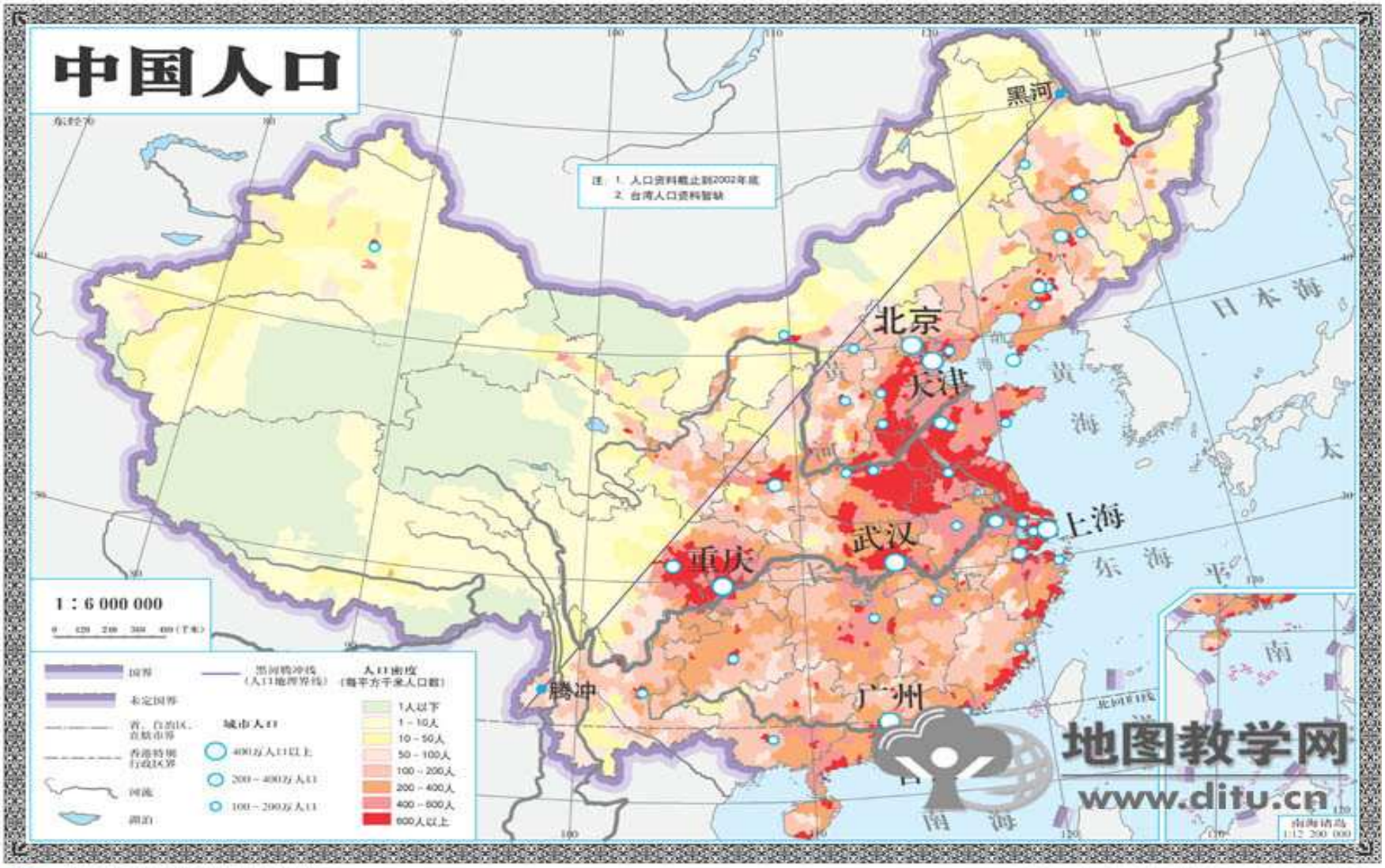








CHINA POPULATION DISTRIBUTION



义务教育课程标准地理教学挂图

Five-Year Plans

- Chinese government determined to de-emphasize quantitative
- Growth and focus on the quality of economic growth
- Plan provides for increased expenditures for education and
- Healthcare, especially in rural areas, environmental protection,
- and air and water pollution control
- Transformation of the Chinese economic growth model
  - From export-oriented to domestic demand-oriented
  - From input-driven to innovation-driven

III. Speed up growth in inland provinces

- Central and Western China are entering a take-off growth period
- Huge infrastructure investment, including a 7,531 km high-speed rail network to date, is connecting inland provinces to the national market

- Strategic designation of Chongqing Liangjiang New Area as a new development zone (similar to Shanghai Pudong) will help create a West China economic hub on the western stretch of the Yangtze river
- Preferential policies in Central and Western China for foreign investors are expected, especially in favored industries

Climate change is at the local level: Mayors know it Best and what to Do

Green Industrial Revolution

figure 6: a decentralised energy future

THE CITY CENTRES OF TOMORROW'S NETWORKED WORLD WILL PRODUCE POWER AND HEAT AS WELL AS CONSUME IT. THE ROOFS AND FAÇADES OF PUBLIC BUILDINGS ARE IDEAL FOR HARVESTING SOLAR ENERGY. 'LOW ENERGY' WILL BECOME THE STANDARD FOR ALL BUILDINGS. GOVERNMENTS COMMITTED TO TIGHT CLIMATE-PROTECTION TARGETS WILL HAVE TO IMPOSE STRICT CONDITIONS AND OFFER INCENTIVES FOR RENOVATING THESE BUILDINGS. THIS WILL HELP TO CREATE JOBS.

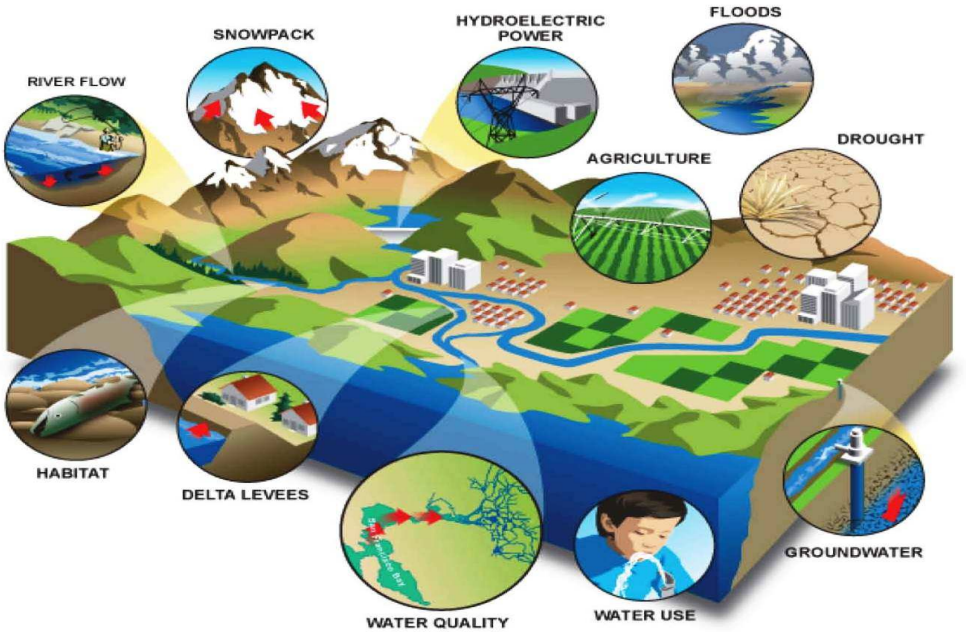
city

1. PHOTOVOLTAIC, SOLAR FAÇADES WILL BE A DECORATIVE ELEMENT ON OFFICE AND APARTMENT BUILDINGS. PHOTOVOLTAIC SYSTEMS WILL BECOME MORE COMPETITIVE AND IMPROVED DESIGN WILL ENABLE ARCHITECTS TO USE THEM MORE WIDELY.
2. RENOVATION CAN CUT ENERGY CONSUMPTION OF OLD BUILDINGS BY AS MUCH AS 80% - WITH IMPROVED HEAT INSULATION, INSULATED WINDOWS AND MODERN VENTILATION SYSTEMS.
3. SOLAR THERMAL COLLECTORS PRODUCE HOT WATER FOR BOTH THEIR OWN AND NEIGHBOURING BUILDINGS.
4. EFFICIENT THERMAL POWER (CHP) STATIONS WILL COME IN A VARIETY OF SIZES - FITTING THE CELLAR OF A DETACHED HOUSE OR SUPPLYING WHOLE BUILDING COMPLEXES OR APARTMENT BLOCKS WITH POWER AND WARMTH WITHOUT LOSSES IN TRANSMISSION.
5. CLEAN ELECTRICITY FOR THE CITIES WILL ALSO COME FROM FARTHER AFIELD. OFFSHORE WIND PARKS AND SOLAR POWER STATIONS IN DESERTS HAVE ENORMOUS POTENTIAL.

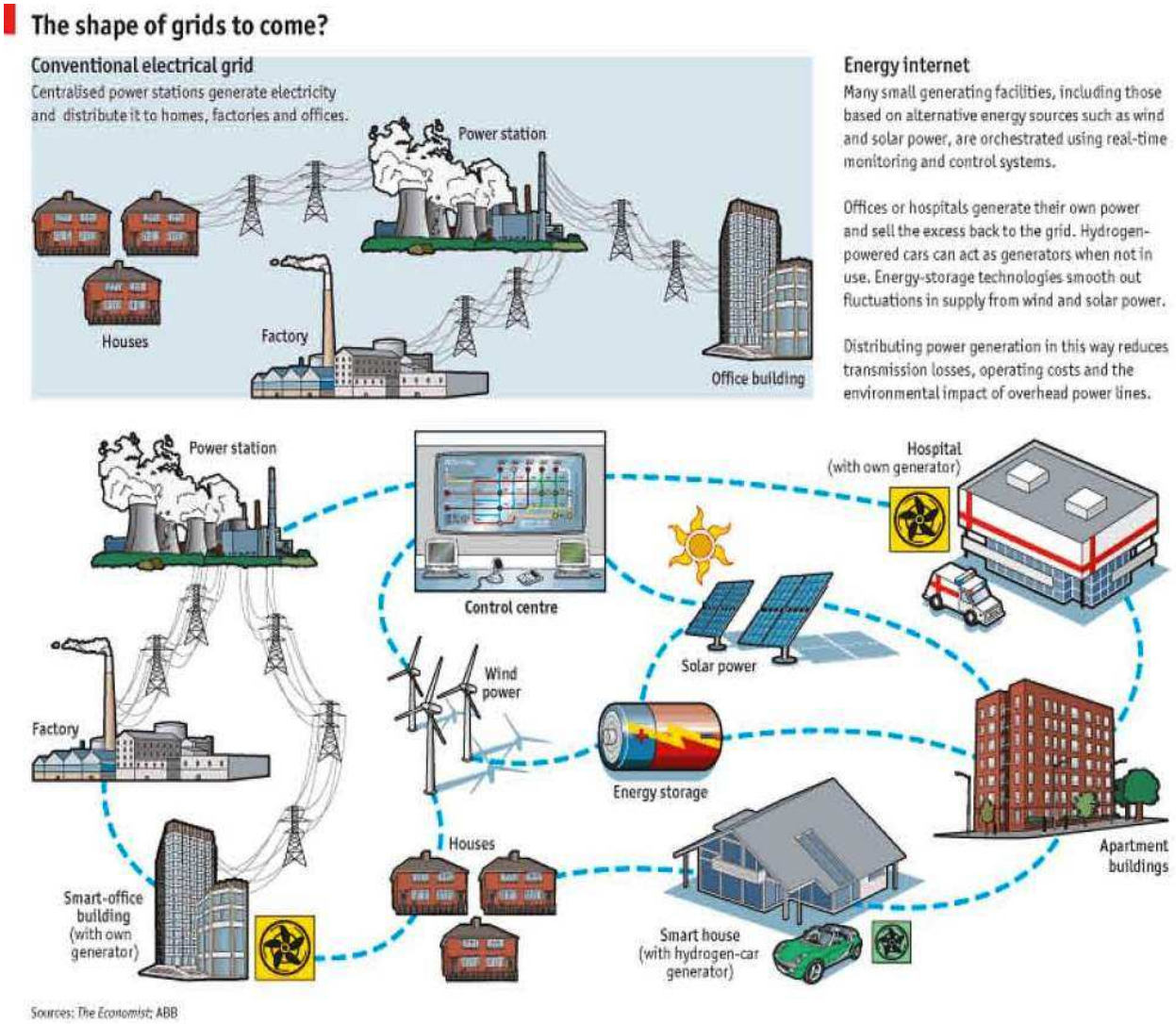
suburbs

1. PHOTOVOLTAIC
2. MINI-COGENERATION POWER PLANT = COMBINED HEAT AND POWER (CHP)
3. SOLAR COLLECTORS (HEATING)
4. LOW-ENERGY BUILDINGS
5. GEOTHERMAL HEAT AND POWER PLANT (CHP)

Sustainable Communities



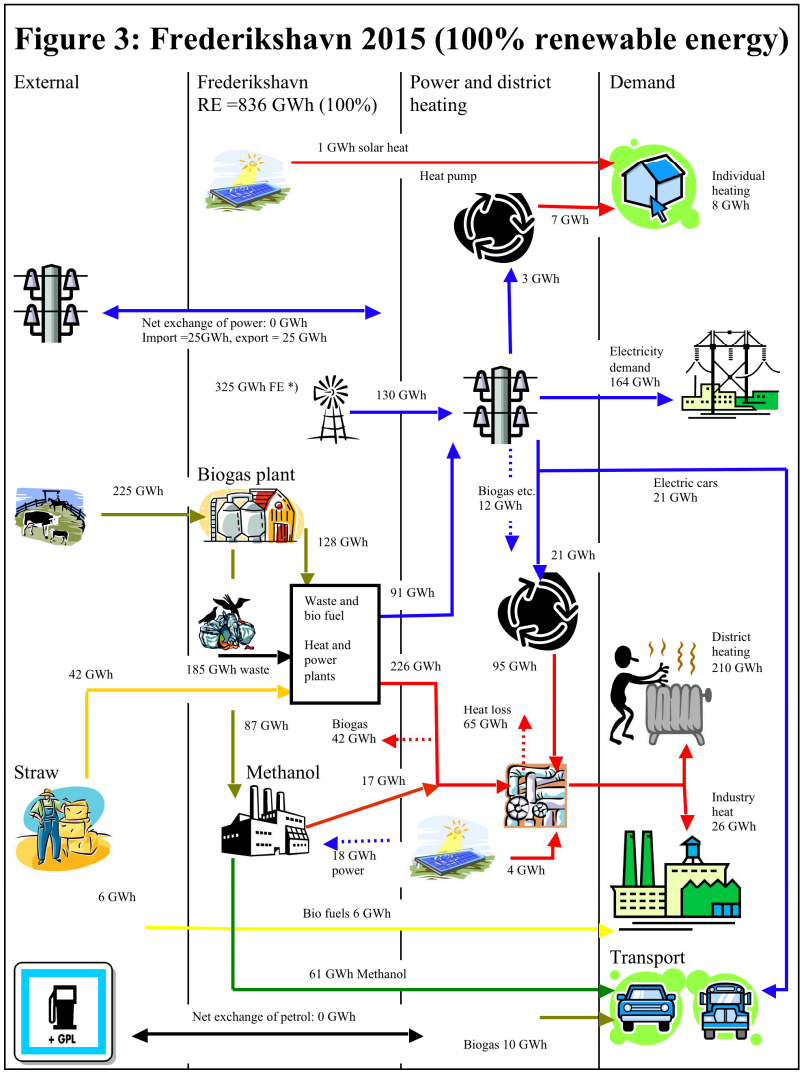
Agile Energy Infrastructures:
central grid and on-site generation



Japan: Energy Independent but not now with nuclear power

Sustainable Communities, Chapter 16 (Springer Press, 2009)

Denmark: Energy Independence through Distributed Generation by 2015



Sustainable Communities, Chapter 10 (Springer Press, 2009)

The Paradigm Shift:
The Green Industrial Revolution

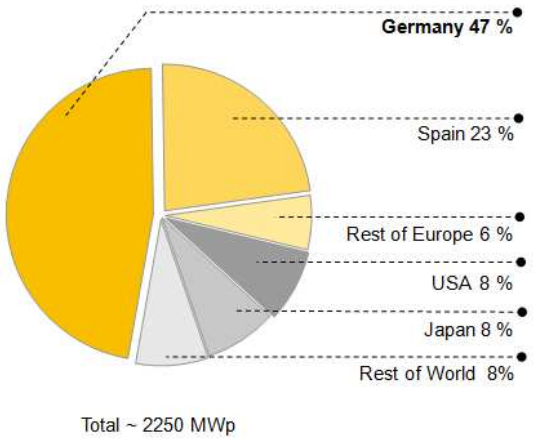
- Major shift in the way Global policy makers and industry frame and implement sustainability to infrastructure issues.
- Model is in IT from telephone land lines to mobile/wireless to iPads and iPhones from the “cloud” with more apps to come.
- Key is to “Leap Frog” traditional technologies and systems.
- Public policy -- Set Goals e.g. RPS, Protocols, Aggregation, Specs, Master contracts, Joint Ventures to share IP and competitive advantage.
- Diversification at the state and local regions of energy supplies must be through clean and renewable sources along with conservation.
- Current volatile global fossil fuels along with national and international concerns for security, energy, environmental, water, climate, crises motivate the paradigm shift.
- Nation-States are becoming “Energy Independent” through diversified energy and environmental policies, programs and shared resources.
- National, regional and local public policy need to use “civic market” partnerships that lead, direct, guide and evaluate the paradigm shift
- Government and State partnerships with private sector in which the public sector has a continuous and on-going vested interest: social capitalism
- Corporate Governance and Oversight with ethics and measurements
- The Next Economic model which depends more on societal values than on personal greed, profit and gains.

The German Feed-in-Tariff

The Renewable Energy Sources Act (EEG) is boosting Germany's economy

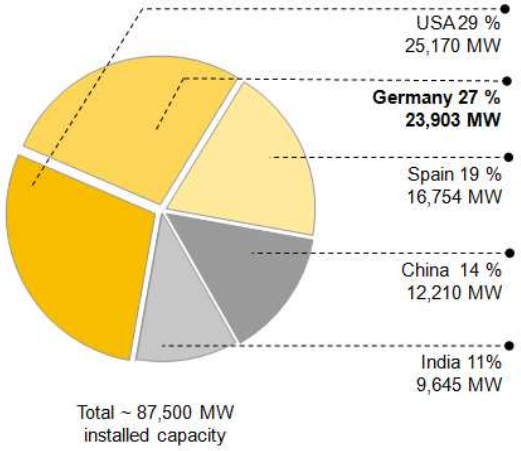
	PV[1)]	Wind[2)]	Biomass[3)]	Hydro[4)]
Total installed power	5.3 GW	23.9 GW	3.2 GW	4.7 GW
Newly installed power	1.5 GW	1.7 GW	0.5 GW	0.1 GW
Employees in industry	48,000	90,000	96,000	10,000
Industry turnover	€ 7 billion	€ 11.7 billion	€ 10 billion	€ 1.2 billion

Germany is the world's leading PV market



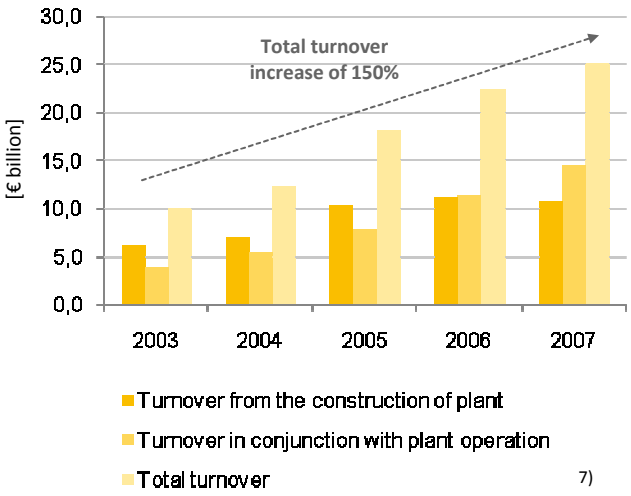
World PV Market Regional Share 2007[5)]

Germany is one of the world's largest wind energy markets



World Wind Energy Market Top 5 2008[6)]

Industry turnover more than doubled in 5 years



7)

Notes: 1) Sources: German Solar Industry Association BSW 2009, Sarasin 2008 2) Source: German Wind Energy Association, 2008 3) Source: German Bioenergy Association, 2007
4) Source: BMU 2008 5) Source: Solarbuzz 2008 6) Source: Global Wind Energy Council, 2008 7) BMU 2008

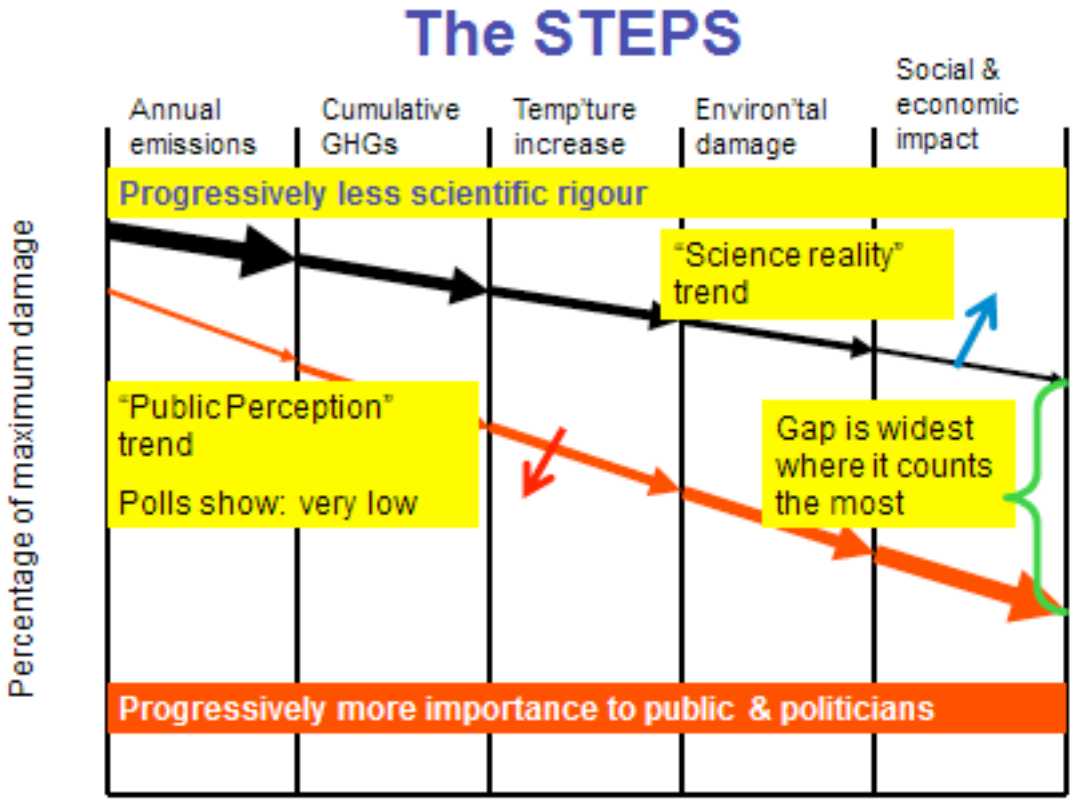
Economic and Finance:

Mortgages include renewable energy systems
Carbon Incentive (tax shift)

Agile Energy Systems, 2004 and Sustainable Communities, Springer Press, 2009

Sustainability Communities

Angels / Venture Capital / Equity Finance



Google: reports that delaying clean energy will costs U.S. trillions $$

Grist Magazine:

McKinsey Low Carbon Economics Tool: 28 June 2011

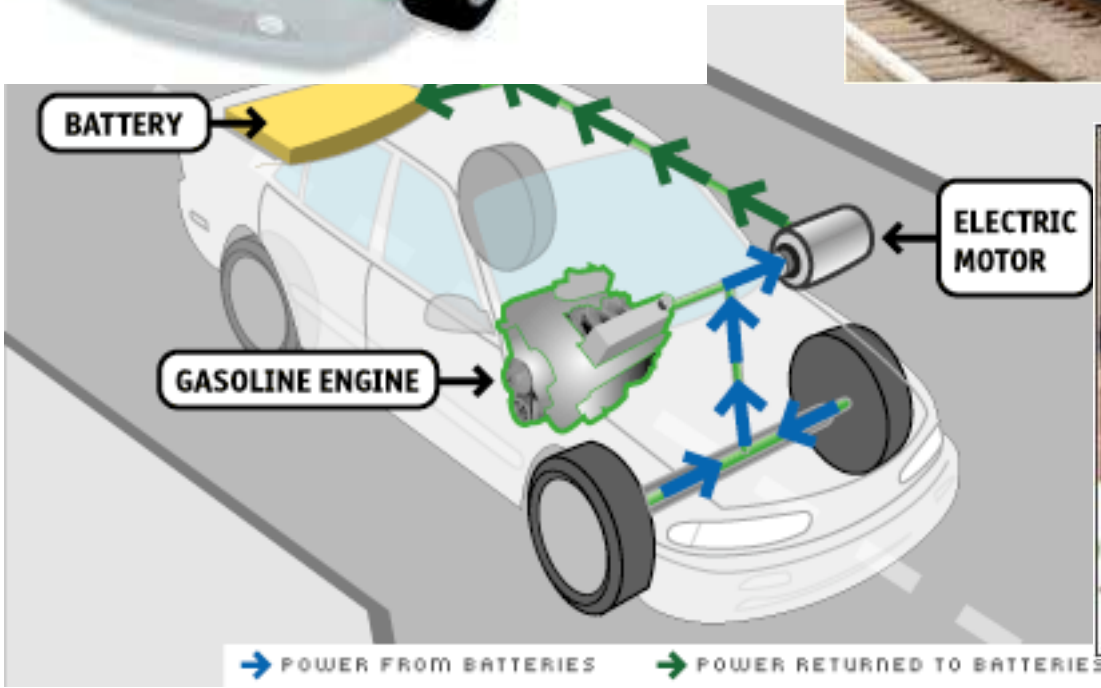
Science Parks

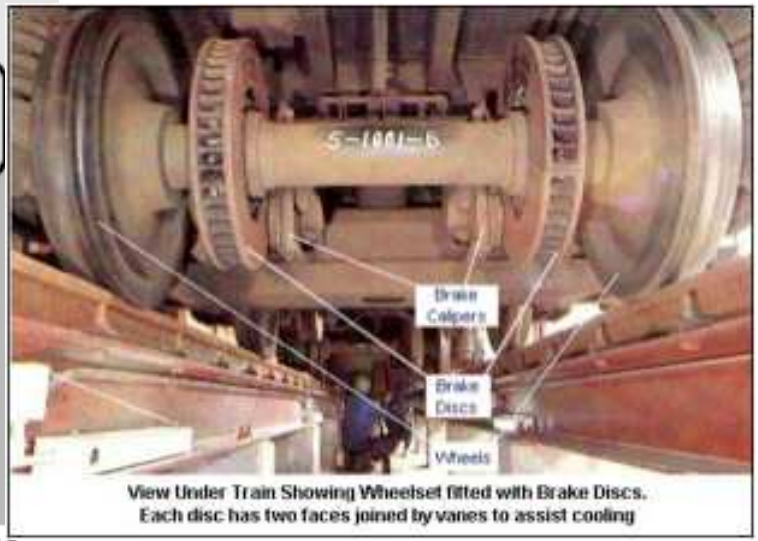
NOVI Science Park,
AAlborg, Denmark

Tsinghua
University,
Beijing

Twente Science
Park, Holland

Regenerative Braking





View Under Train Showing Wheelset fitted with Brake Discs.
Each disc has two faces joined by vanes to assist cooling

Solar Hydrogen Station Technology

Unique Honda Designed

Electrolyzer (PEM type)

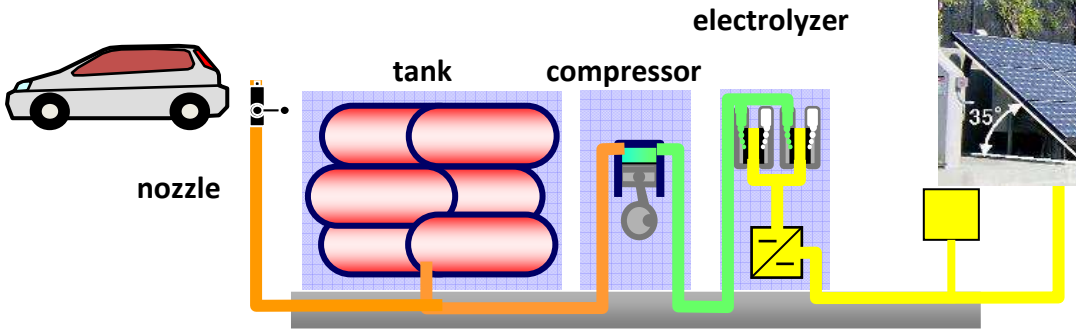
Hydrogen

Renewable Electricity

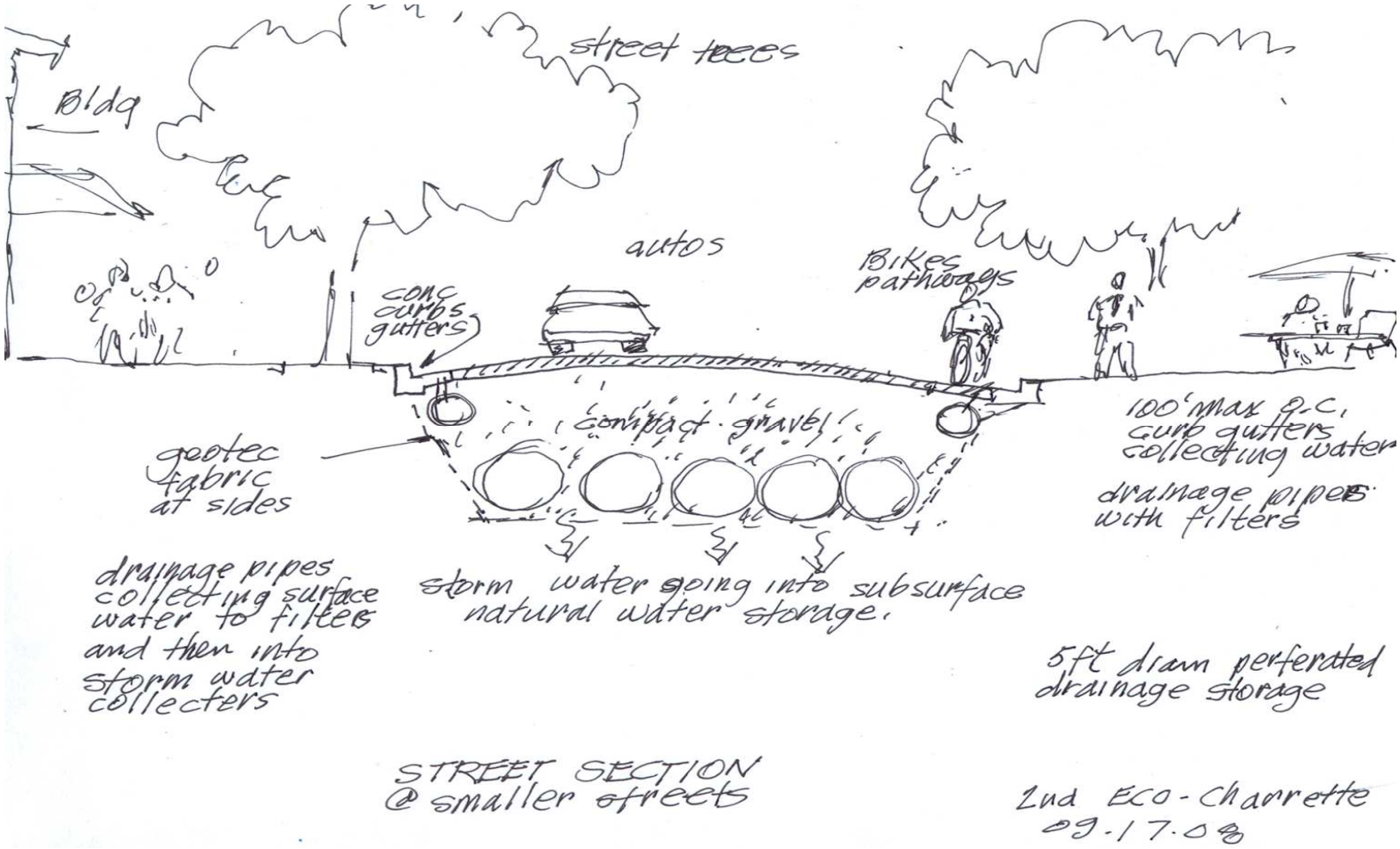
Water

Honda Produced

Solar Cells (CIS type)



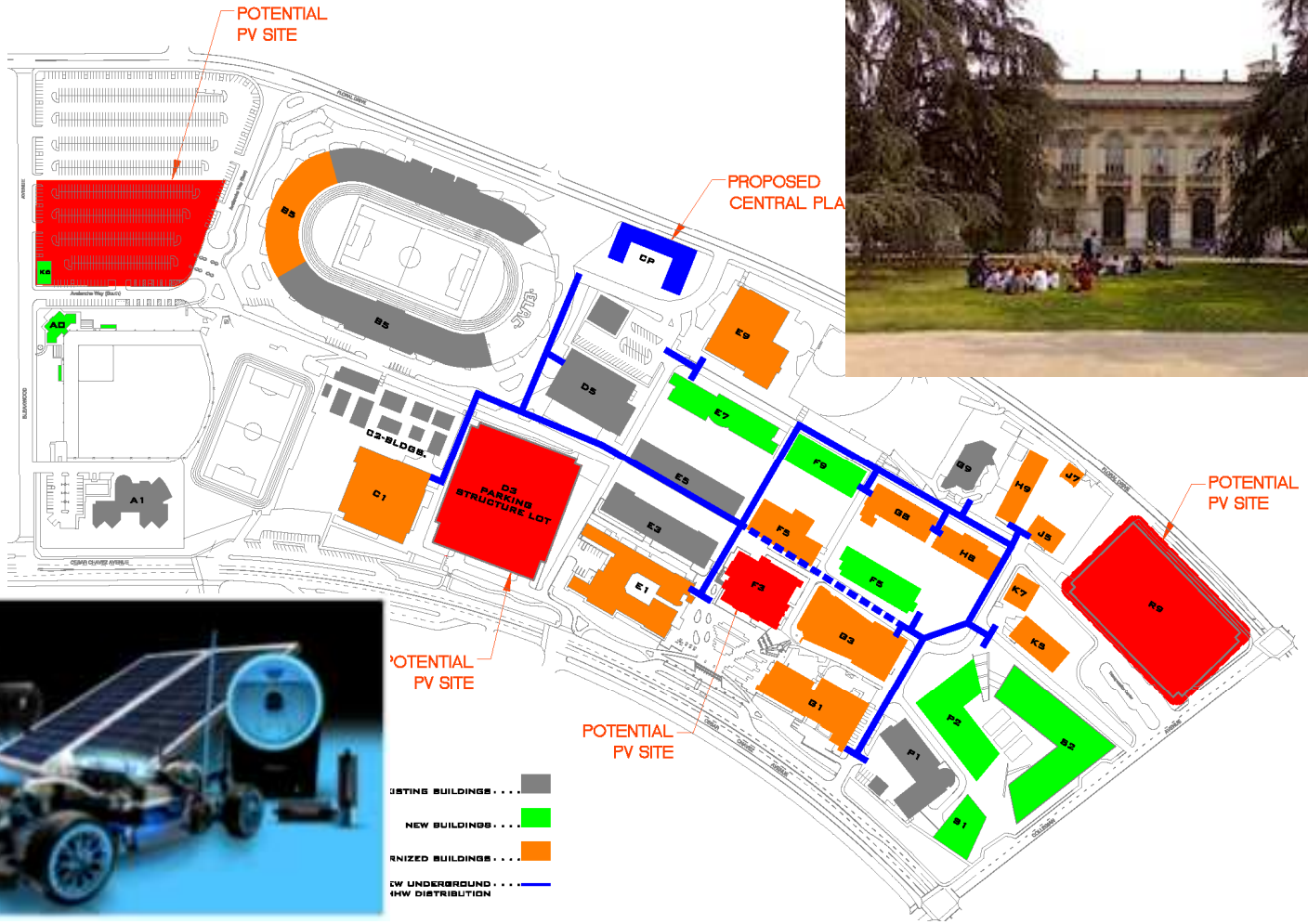
Chpt #4: Sustainable Community Design



Sustainable Communities, Chapter 4 (Springer Press, 2009)

East LA College Campus

Central Plant and Solar/PV

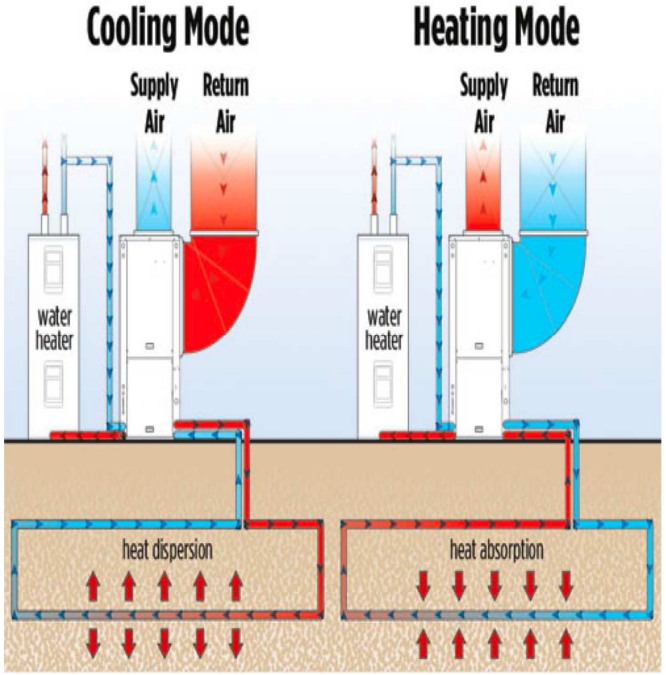


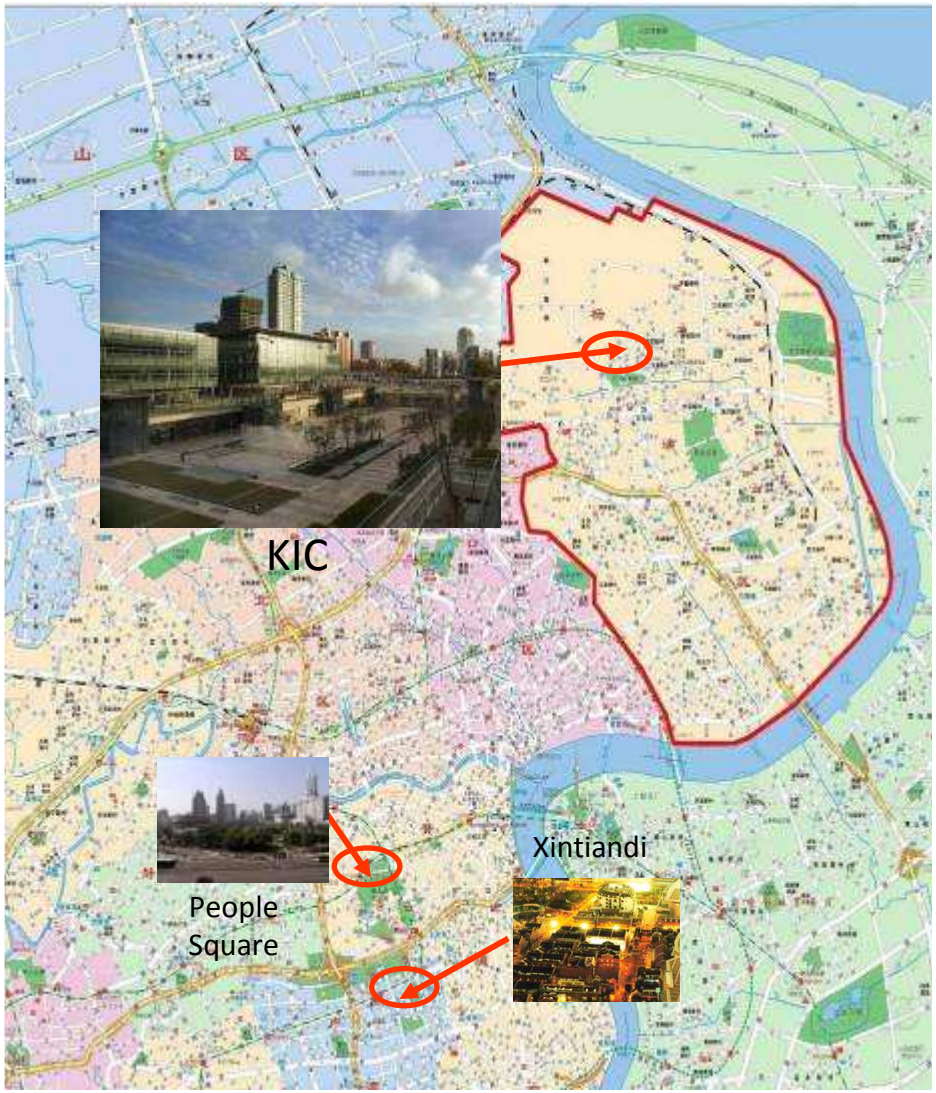
Sustainable Communities, Appendix (Springer Press, 2009)

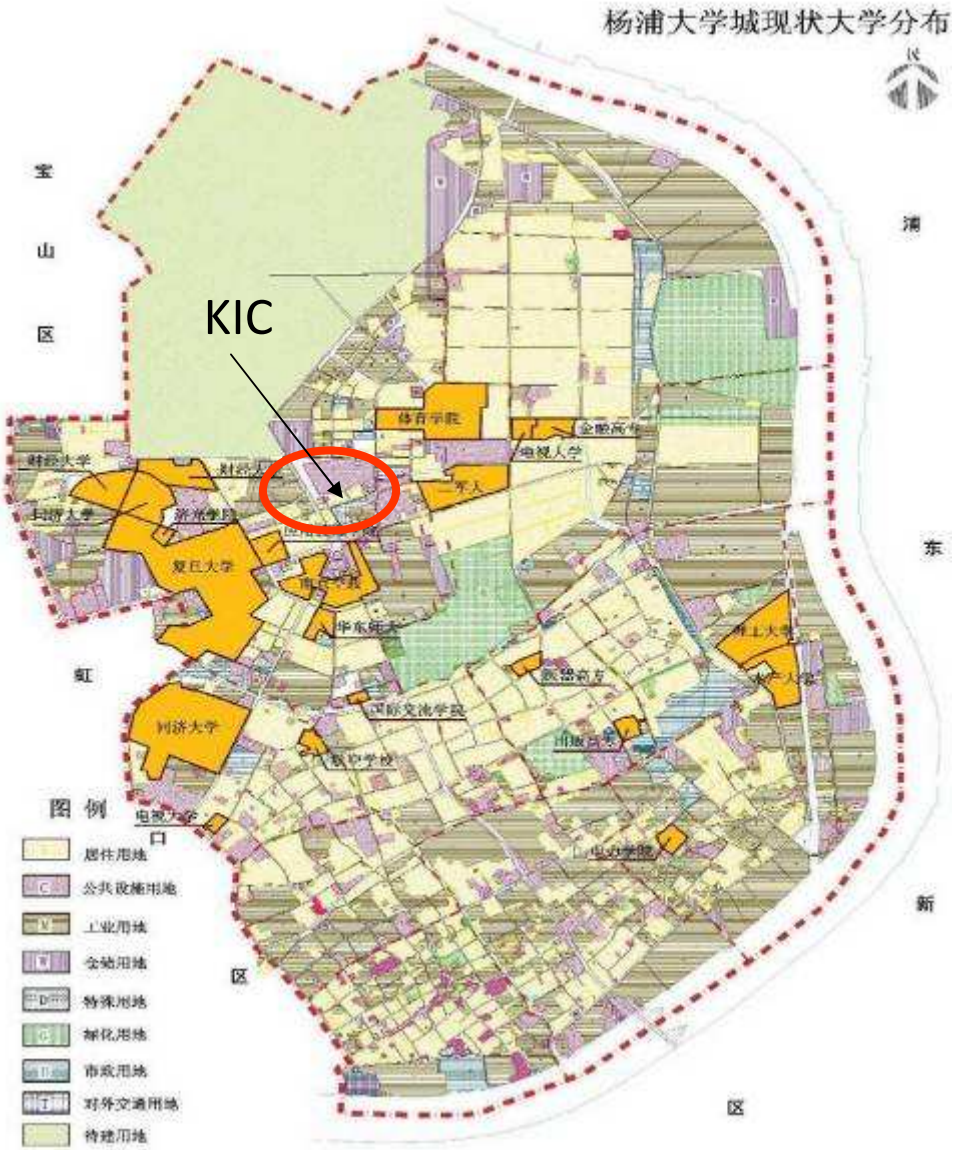
Google: 1.6MW SolarCampus, Electric cars, fuel cells and efficiency

Sustainable Communities, Chapter 8 (Springer Press, 2009)

Sustainability is Affordable

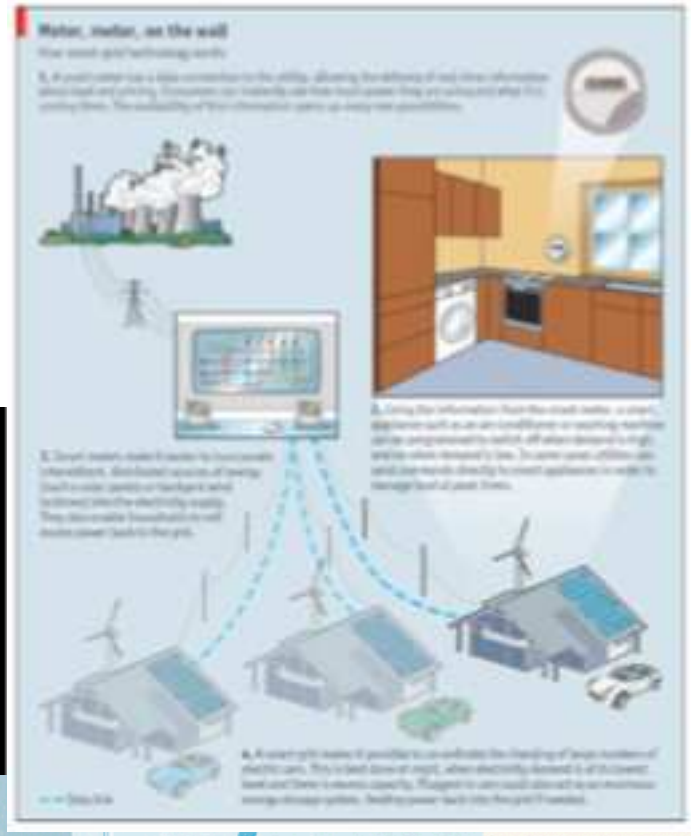


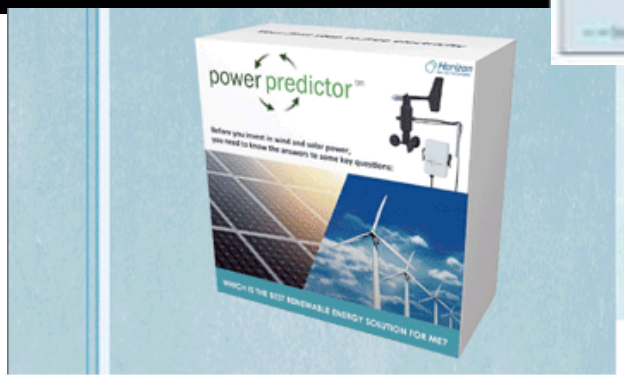


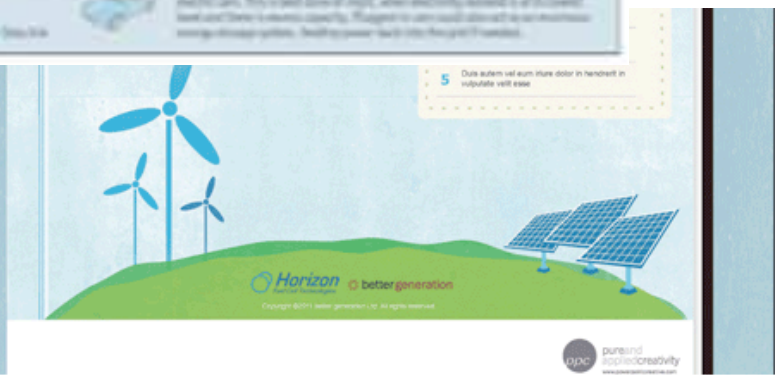


14 Universities and Colleges with More Than 130,000 Students

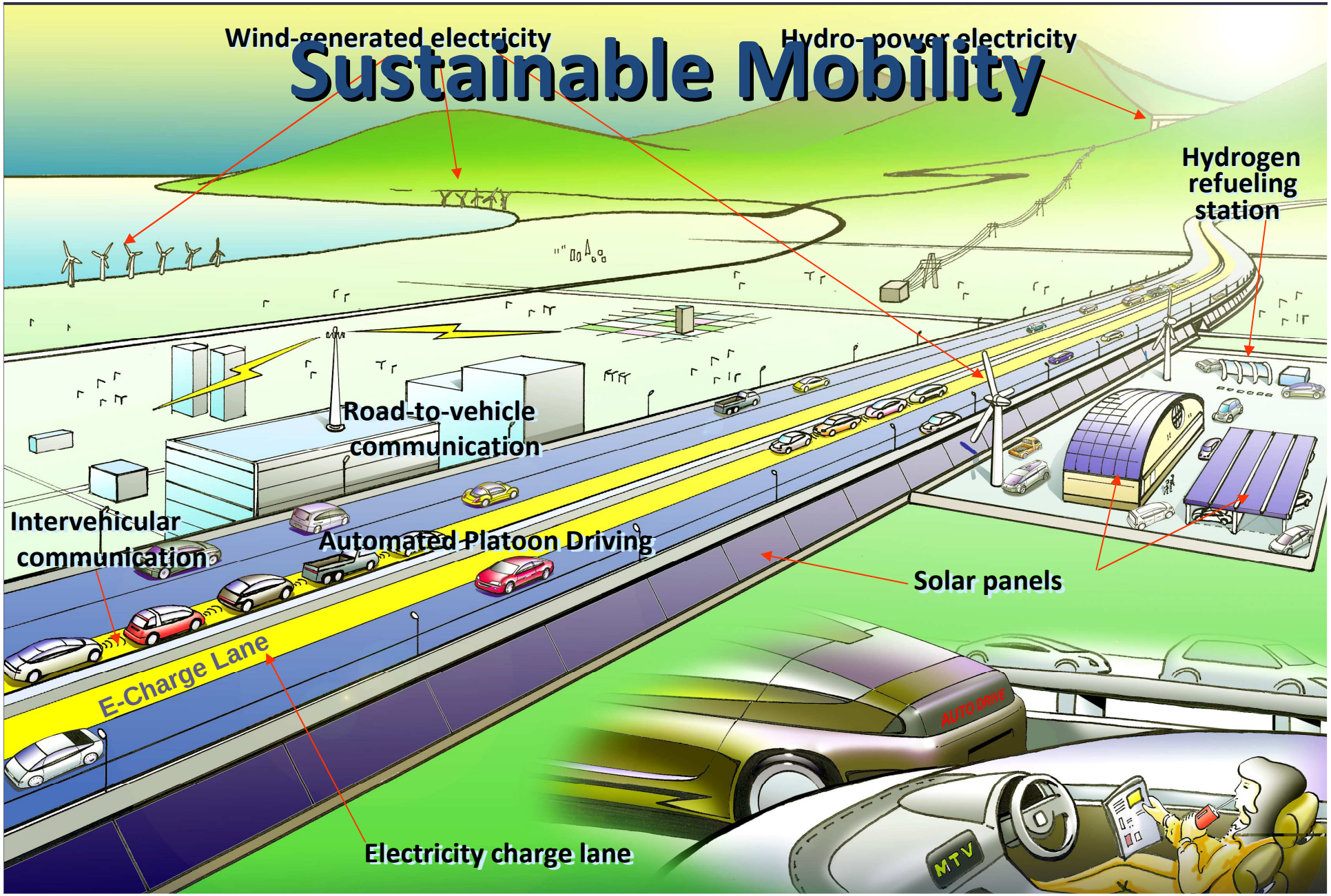
Educational for the Green Industrial Revolution







A Vision of Future



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Sustaining the World through Innovation and Economics