City and Energy
Towards a sustainable development

CONSIGLIO NAZIONALE
DEGLI INGEGNERI
CNI

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The National Council of Engineers (CNI) is the national and institutional representation of the relevant interests of engineers.

The CNI plays a major role in promoting, developing and enhancing the role of the engineer in order to:

- **increase its impact in the society;**
- **pursue growth of the profession in service of the community;**
- **promote the essential role of the engineer in processes of evolution and change of the community.**

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THE Energy Workgroup

The Energy workgroup is an advisory body of the CNI to support the strategies and actions to be taken in the energy sector.

It consists of 10 energy experts from all over Italy coordinated by ing. Gaetano Fede (member of the National Board of Engineers).

Activities:

- **link between the local councils and CNI on the correct application of the national regulations;**
- **contacts with Ministries for all initiatives concerning the respect for and the protection of the rights of engineers in the field of energy and environment;**
- **memorandum of understanding with other associations and Standardization Organizations ;**
- **providing news and information in the field of energy**

World consumption:

World energy consumption 2010: 12 Gtoe

World energy consumption in the history:

- 300 Gtoe from non-renewable energy source

- 100 Gtoe from renewable energy source

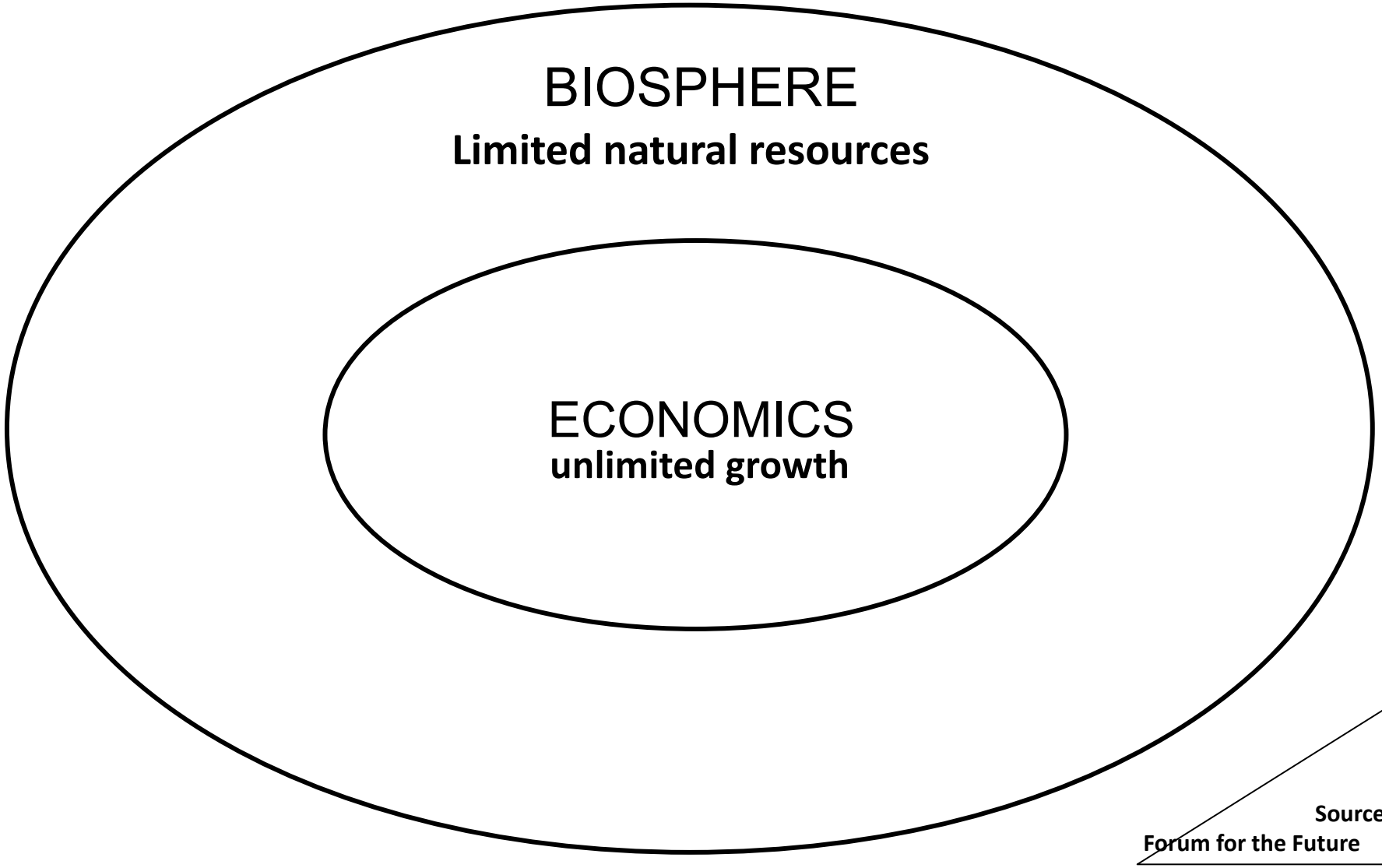
= 6 Lake GARDA 370 km2 49 km3

QUESTIONS:

- How many Lake Garda are still available?

- How many lake Garda may be burnt without causing irreversible damage to the environment?

The paradigm of sustainability



Source:
Forum for the Future

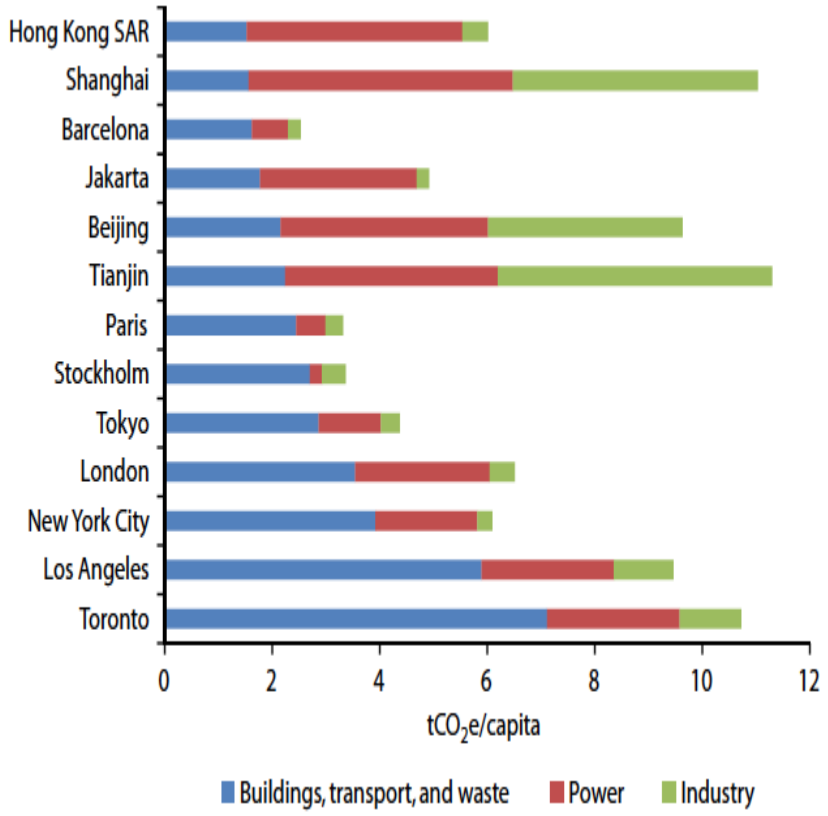
With over half the worlds population living in cities and the vast majority of economic activity occurring in cities, it is clear that if we are to successfully create a ***sustainable*** future we have to focus on cities.

The global effort for sustainability will be won, or lost, in the world's cities, where urban design may influence over 70 percent of people's ***Ecological Footprint***.

(Wackernagel - President of Global Footprint Network)

Energy Concerns in Urban Development

- Cities occupy 3% of the Earth's land surface, and house 75% of the human population
- Most production, trade and transportation activities usually are located in these areas. *[80% of Asia's GDP is produced by Asian cities]*
- Cities account for a considerable portion of a country's energy consumption. *[2/3 of worldwide energy usage and GHG emissions]*

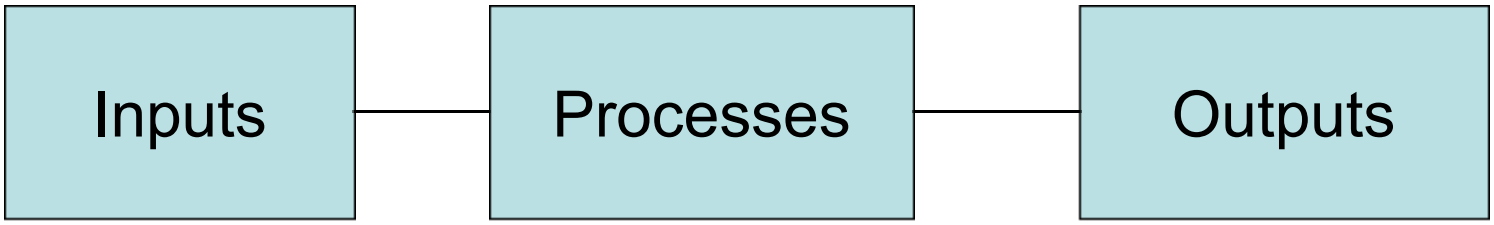


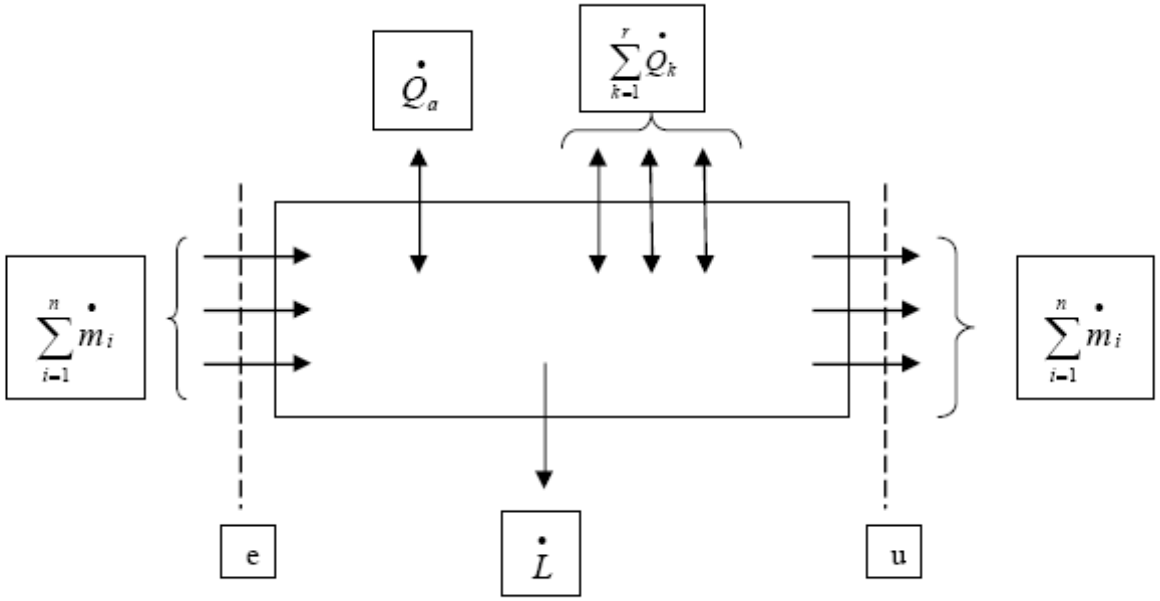
Per capita carbon emission of selected cities (World Bank, 2010)

Source: Manuel L. Soriano

The City as a System

To help understand how cities can be designed in a more sustainable way we can use a systems approach.





Natural ecosystem

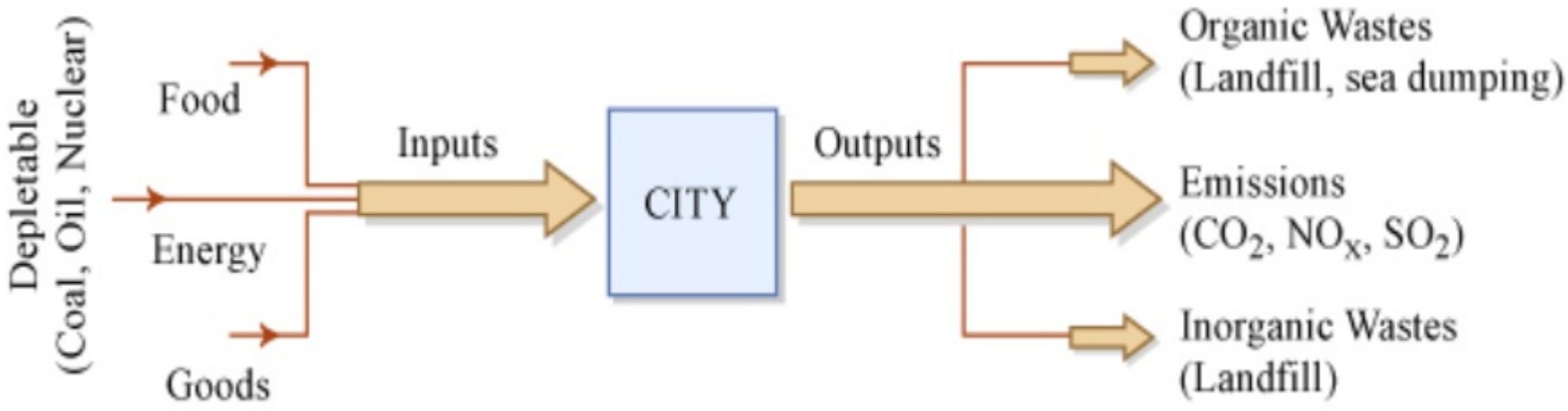
"the complex of a community and its environment functioning as an ecological unit in nature."

Large city

- **the cycle of matter is open. During the transformation of raw materials into goods, in the production and consumption of the goods there is waste generation that only partly can be recycled**
- **the energy flow is based mainly on non-renewable sources with a high energy content, that can be concentrated and stocked**
- **energy dissipation and entropy increase is higher than the natural entropy process, precisely because of the high concentration of urban structure, services and production**

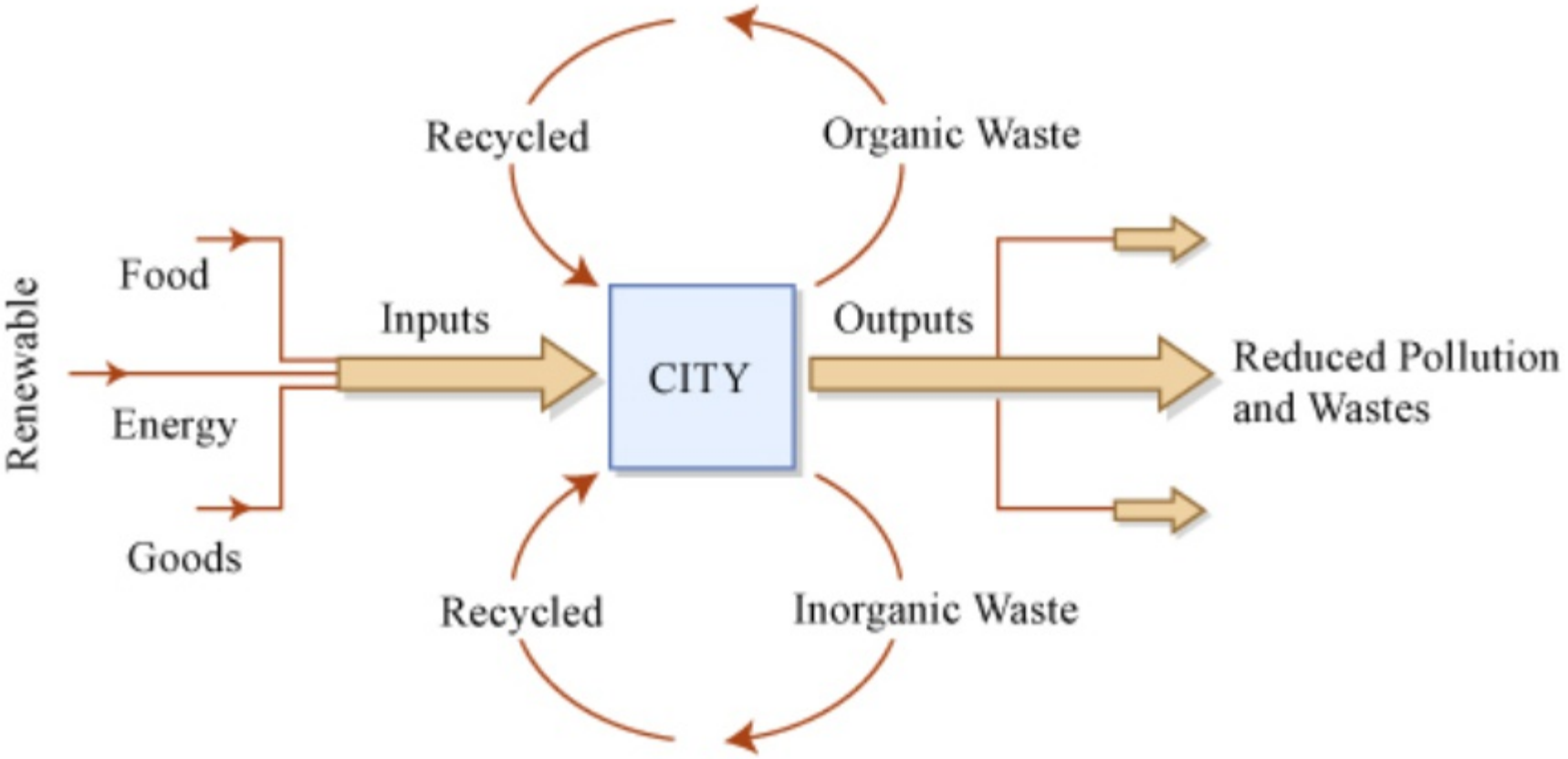
THIS MEANS THAT CITIES ARE NOT ECOSYSTEMS

Unsustainable Linear Urban Metabolism

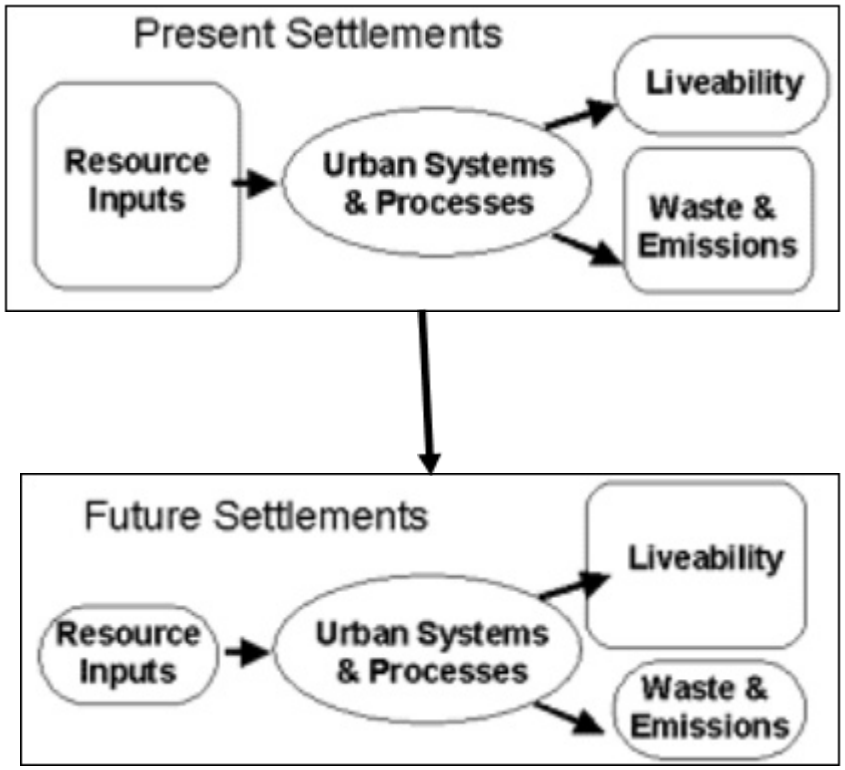


A) 'Linear metabolism' cities (consume and pollute at a high rate)

Sustainable Circular Urban Metabolism



B) 'Circular metabolism' cities (minimise new inputs and maximise recycling)



Unsustainable City

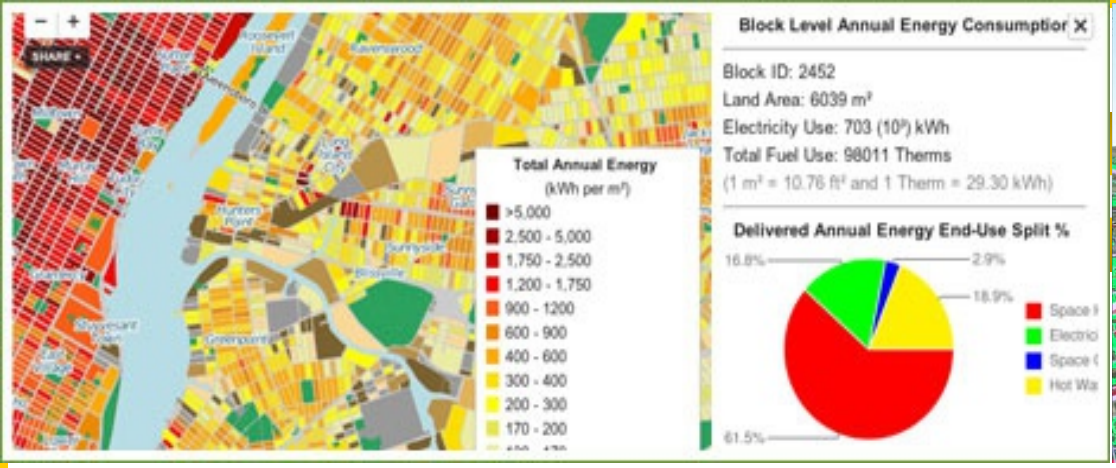
High level of inputs. Not satisfying our needs (e.g. congestion,poor air quality). Producing large amounts of waste and pollution.

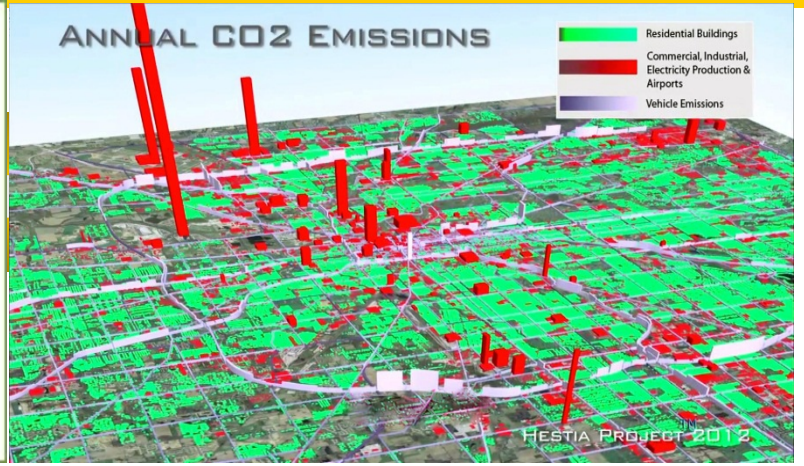
Sustainable City

Reduced level of inputs. Satisfying our needs (good quality of life). Reduced levels of waste and pollution.

Desired Change:

- Reduced resource use
- Reduced waste & emissions
- Greater liveability
- Improved urban systems and processes





- **Urban Systems – Infrastructures; resource intensive (energy, water, materials and land); Difficult and costly to modify.**

- **Traffic congestion - Inadequate road & transport infrastructures - cost can be as high as 10% of the city's GDP.**

- **Typical buildings – non-energy efficient - can account for 40% of a city's total energy consumption and 30% of GHG emissions.**

- **Expansion of infrastructures (rapid urbanization; fast economic growth; increased competitiveness etc.).**

THE WAY A CITY IS PLANNED, DESIGNED, OPERATED AND MAINTAINED WILL INFLUENCE ITS FUTURE ENERGY USAGE AND EMISSIONS (GHG & POLLUTANTS)

Source: Manuel L. Soriano

Sustainable Development

CHALLENGES TO OVERCOME

Institutional Challenges

- *e.g., Divided responsibilities and split incentives of relevant stakeholders; energy and climate change are not mainstreamed in urban development planning processes*

Energy Use and Energy Policy Challenges

- *e.g., Energy planning not responsibility of cities; existing laws, regulations not supportive of energy efficiency and renewable energy initiatives; restrictive regulations and default controls*

Political Challenges

- *e.g., Local authorities support missing; changes in administration often translate to change in policies; lack of awareness & information about the economic, environmental (and also political) benefits of sustainable development*

Social/Community Challenges

- *e.g., Local communities not aware and resistant to proposed changes lifestyles and attitudes*

Capacity & Financial Challenges

- *e.g., City planners & engineers not skilled/knowledgeable of the opportunities of funds development; Lack of local financing for sustainable development initiatives*

Source: Manuel L. Soriano

Sustainable Development

A CHANGE OF GEAR

Integrating Energy & Environment Concerns & Impacts in:

Land Use and Transport Planning

Contiguous development patterns; parking plans and siting; street design and layout; traffic rules; trip reduction measures; citizens participation, etc.

Site Planning and Building Design

Building efficiency; orientation; landscaping; building services design and operations; pedestrian facilities; transit facilities, etc.

Infrastructure Efficiency

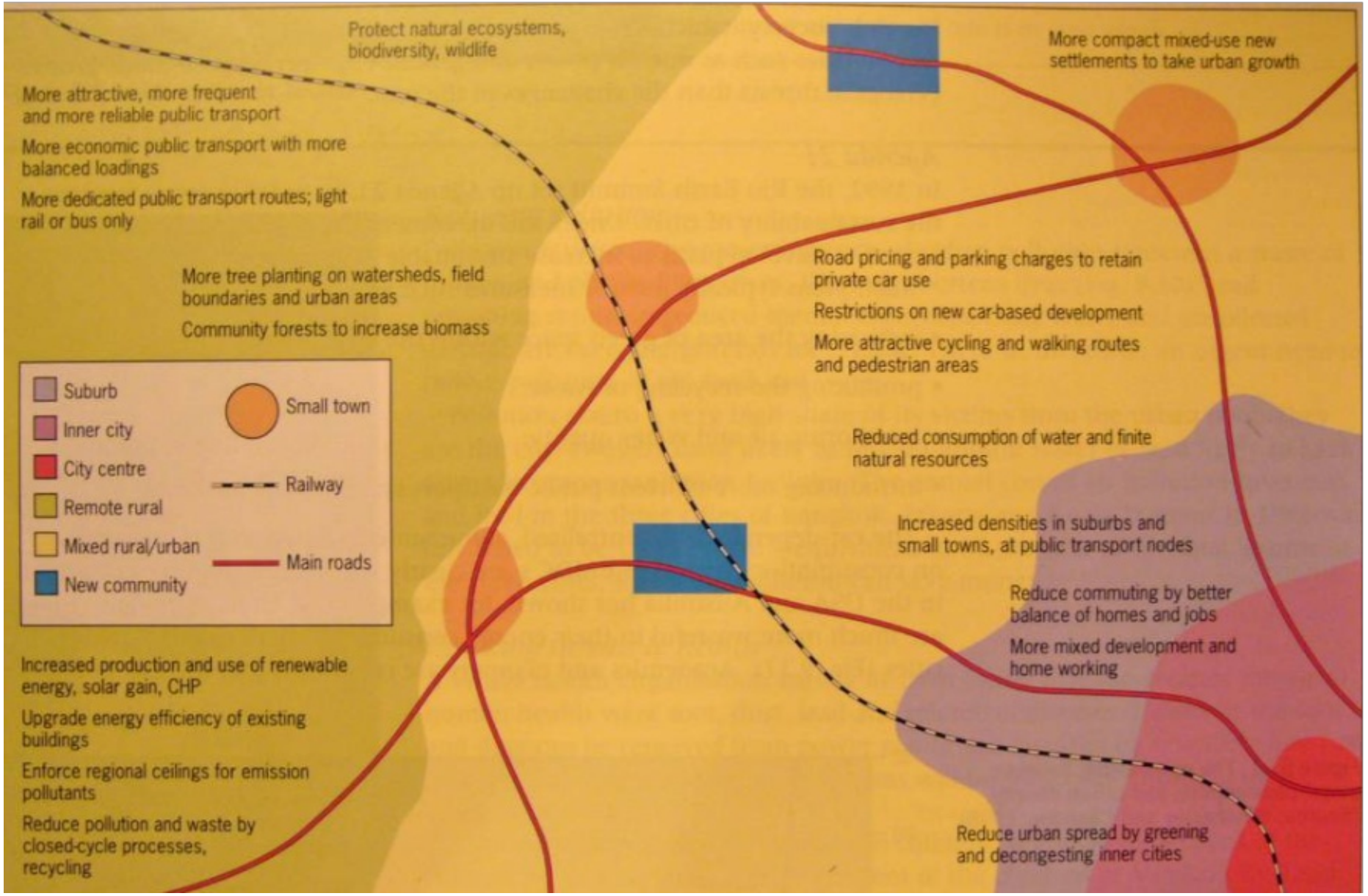
Water supply and use; wastewater collection and storm drainage; solid waste collection & recycling facilities; heat & power recovery; joint infrastructure planning & delivery.

Energy Supply

Electricity supply & distribution; district heating & cooling; waste heat utilization; cogeneration systems; waste-to-energy systems; renewable energy utilization, etc.

Source: Manuel L. Soriano

Some ideas to develop a Sustainable City



Source: Manuel L. Soriano

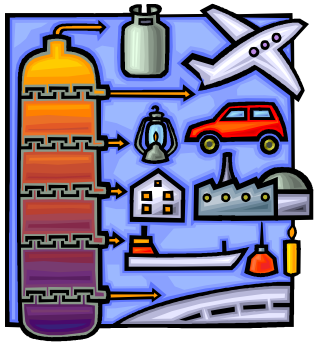
Sustainable Development

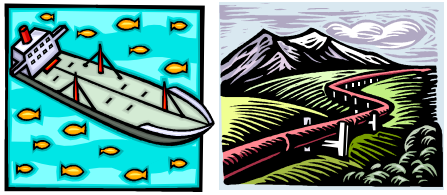
Sustainable and Energy Efficient Cities

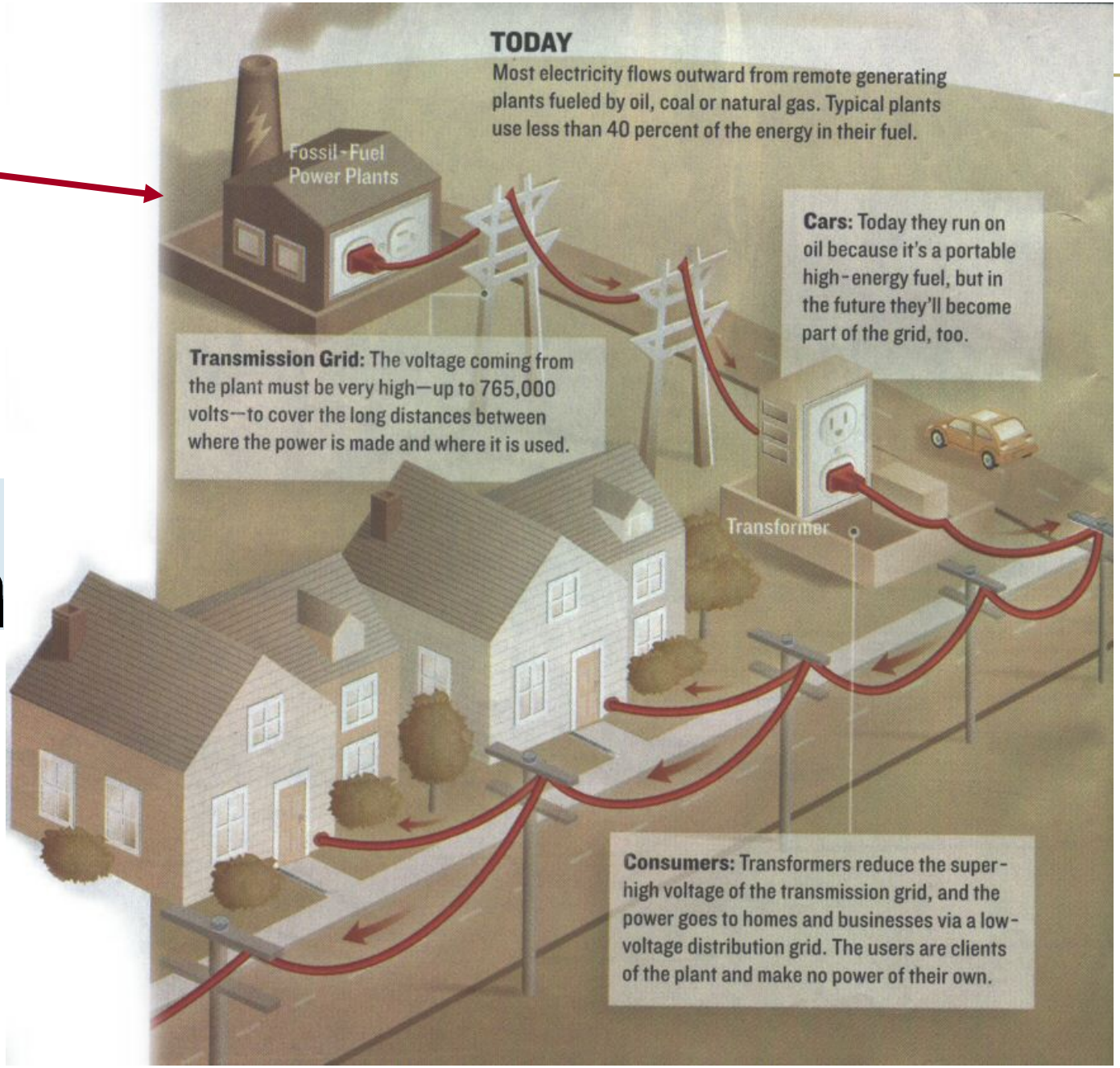
Benefits of Sustainable Development of Cities

- GHG Emission Reduction *(climate change mitigation)*
- Energy Use and Energy Cost Reduction
- Preservation of Natural Environment
- Pollution Reduction (air, land, water)
- Improved Public Health (reduction of the high costs)
- Empowered Communities
- Enhanced Quality of Life in Cities *(safety, welfare and well-being)*
- Improved Economy and Competitiveness

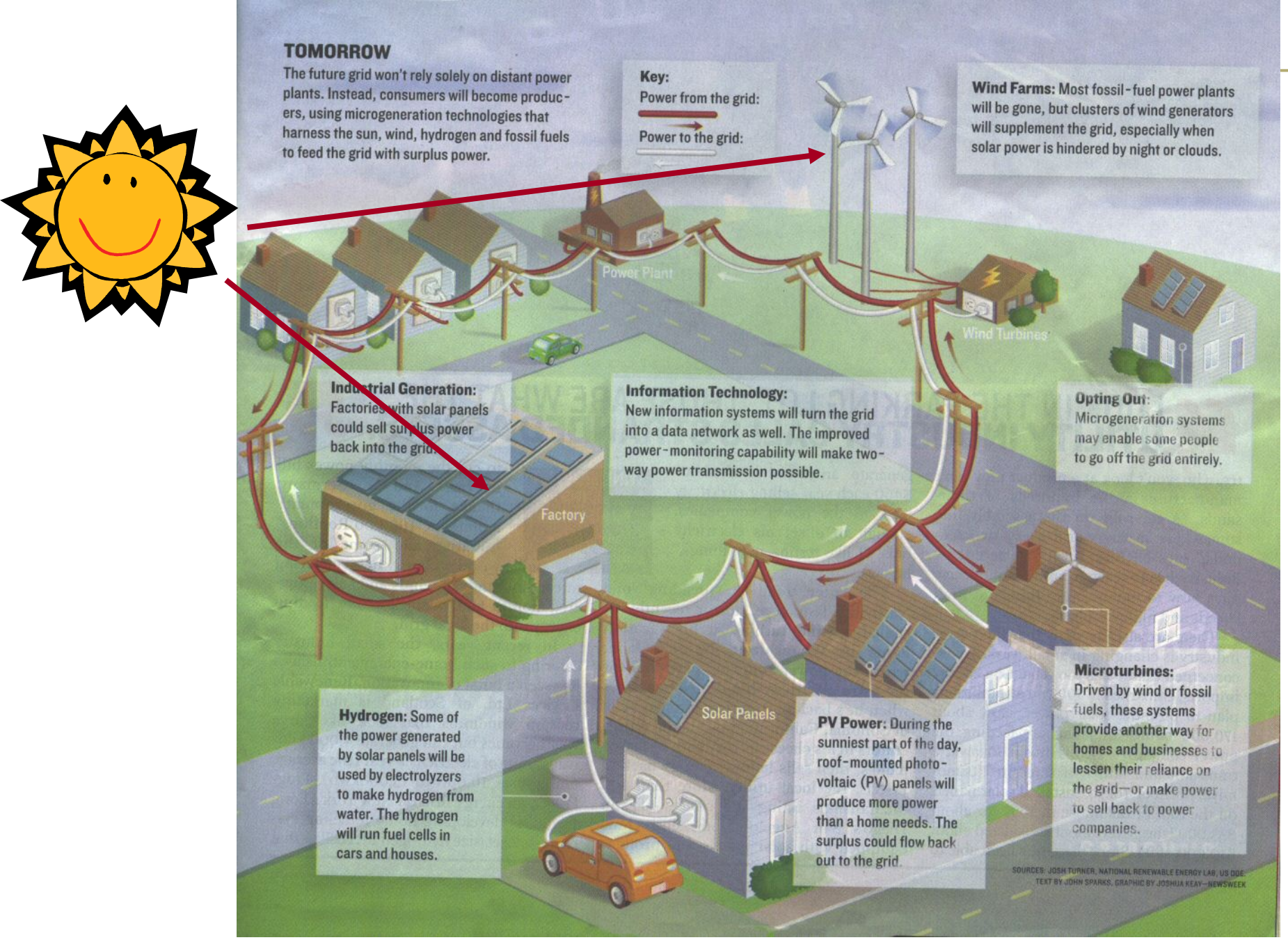
Source: Manuel L. Soriano







Fonte: Newsweek



Fonte: Newsweek

Conclusions

- **How urban areas expand in the future has big implications on the GHG emissions that are generated in cities.**
- **Urban development planning should consider energy as one important component of sustainable development.**
- **Energy and Climate Change should be mainstreamed into the urban development planning processes**
- **Policies formulated for various concerns in city development plans should be in accord with the preservation of man's environment and the provision of energy for sustaining growth and development.**
- **The capacity of local governments should be improved to better identify the optimum mix of regulatory and public financing instruments to attract catalytic financial flows toward low-emissions climate-resilient development.**
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THE SUCCESS OF AN ENERGY INTEGRATED CITY DEVELOPMENT PLAN CAN ONLY BE ENSURED IF THERE IS POLITICAL SUPPORT.

WITHOUT IT, ANY PLANNING APPROACH WILL FAIL.