CENTRO INTERUNIVERSITARIO
DI RICERCA PER LO SVILUPPO
SOSTENIBILE CIRPS

SAPIENZA
UNIVERSITÀ DI ROMA

IR3S

International Conference on Sustainability Science 2009

February 6, 2009
Track 1: Climate Change and Energy
Session 2: Energy Sustainability

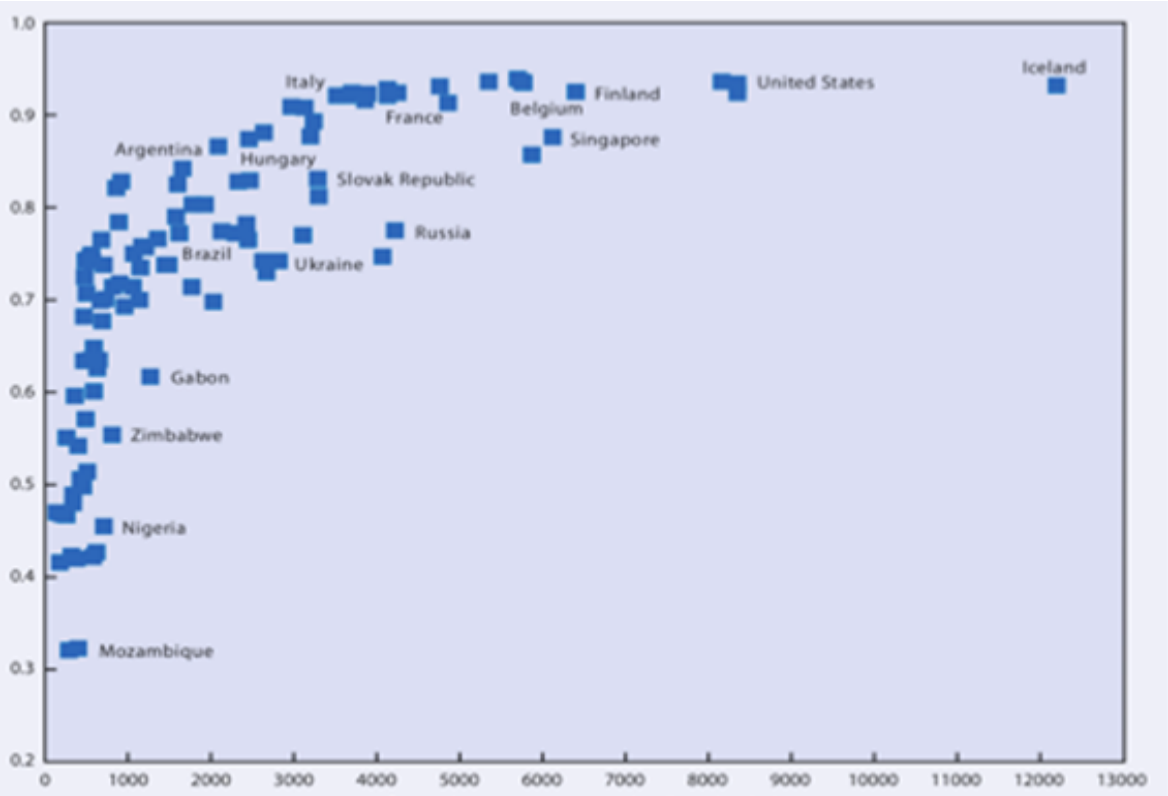
Chair : Prof. Vincenzo Naso, CIRPS - Sapienza University of Rome, Italy

Energy

Current human use = 15TW (1.5x1013)
90% from fossil fuel
0.01% solar input to Earth

Energy is a key driver of social and economic development!

Human Development Index

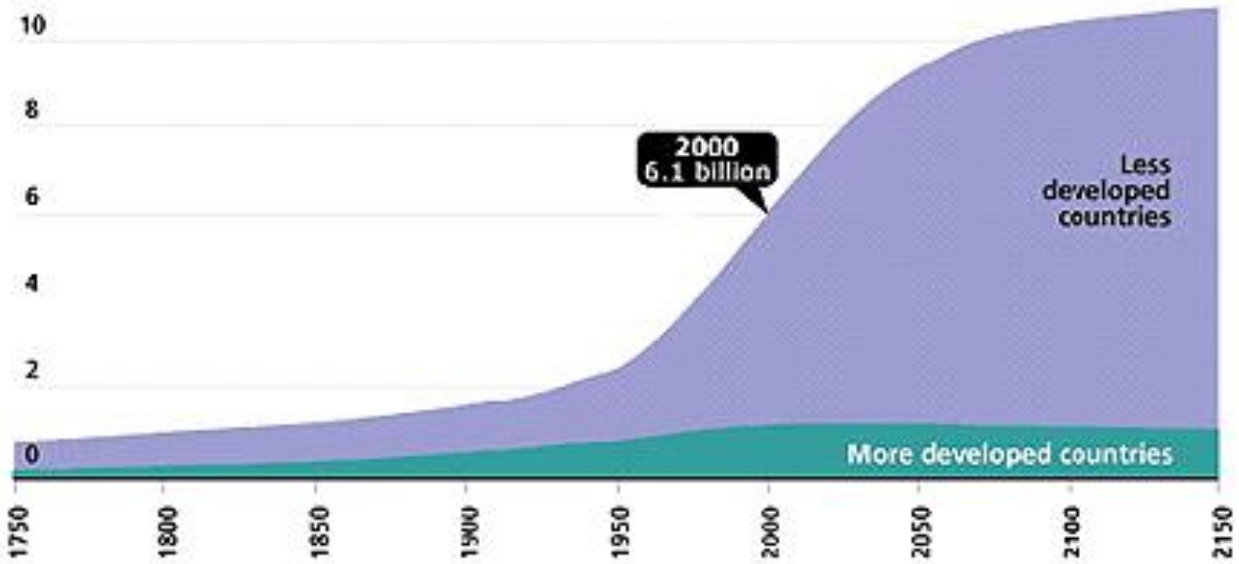


Per capita energy consumption (kgoe/capita)

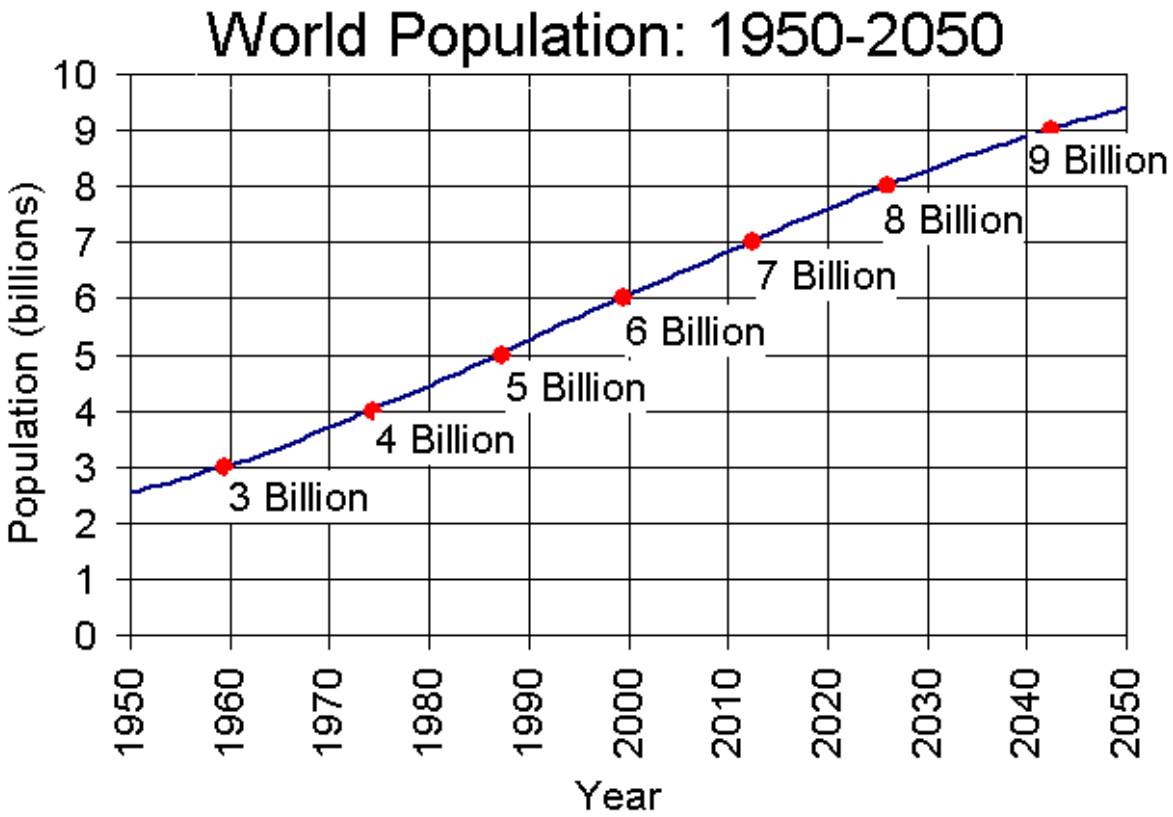
Source: UNDP 2004

World Population Growth, 1750–2150

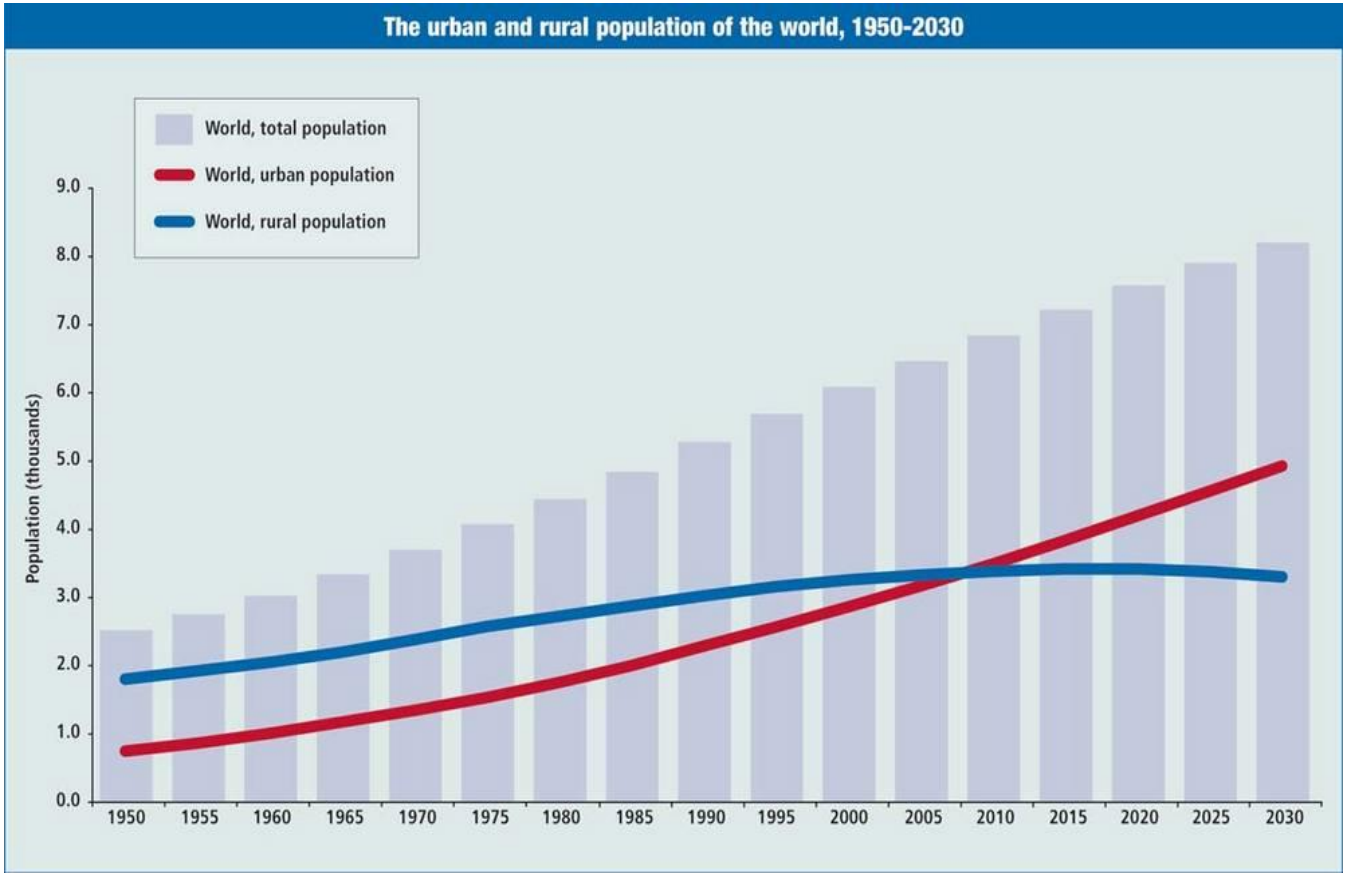
Population (in billions)



Source: United Nations, *World Population Prospects, The 1998 Revision*; and estimates by the Population Reference Bureau.

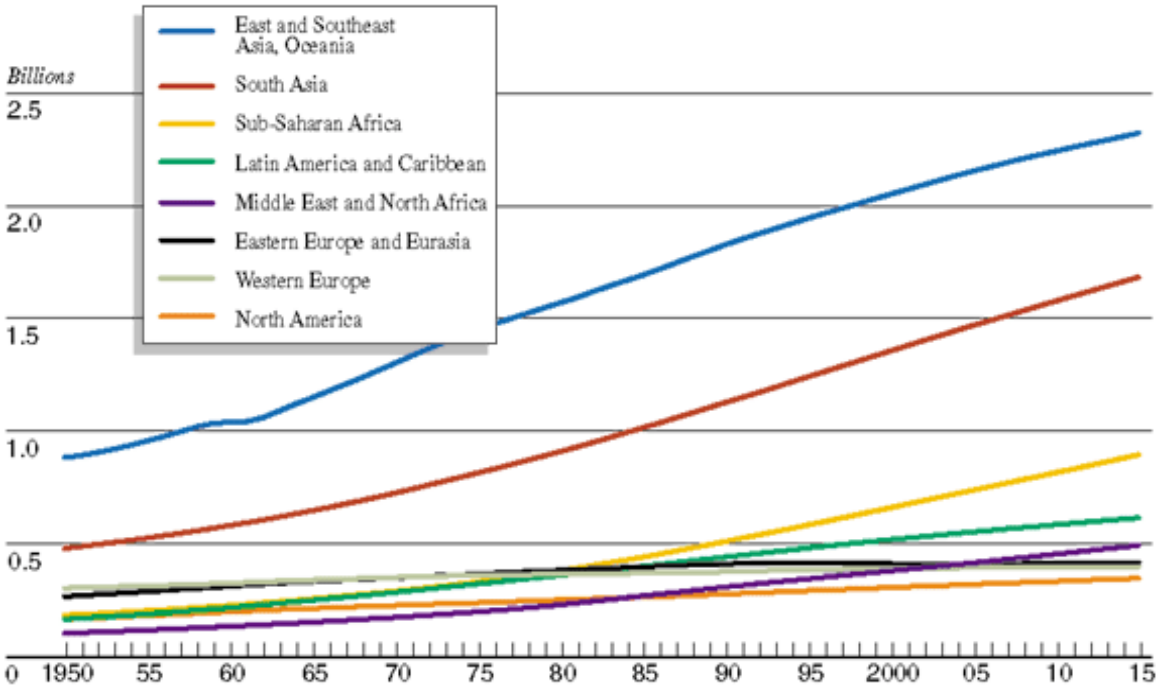


Source: U.S. Census Bureau, International Data Base, July 2007 version.



Source: United Nations, World Population Prospectus, The 2005 Revision

Regional Population: 1950-2015



Source: US Bureau of the Census.

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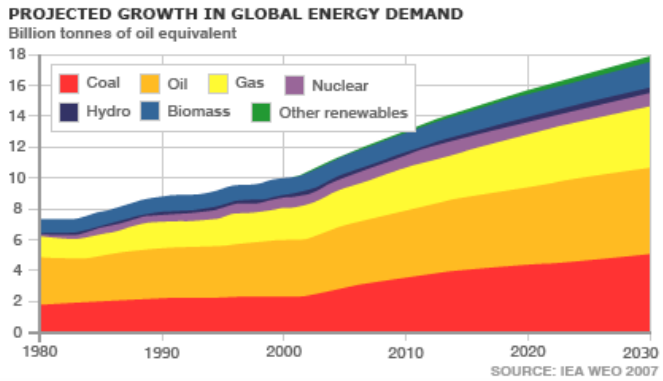
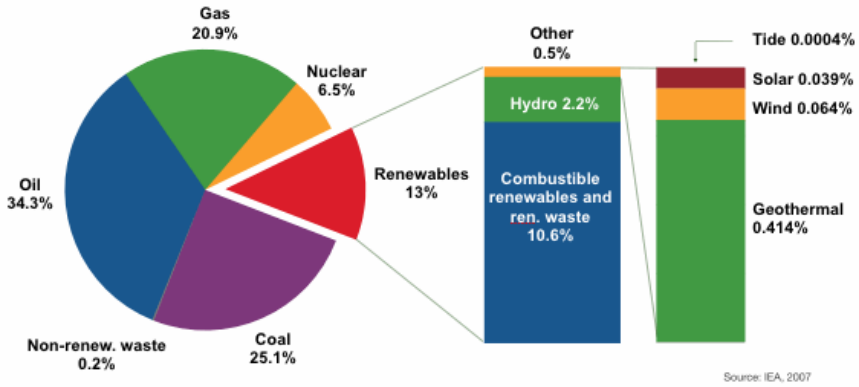
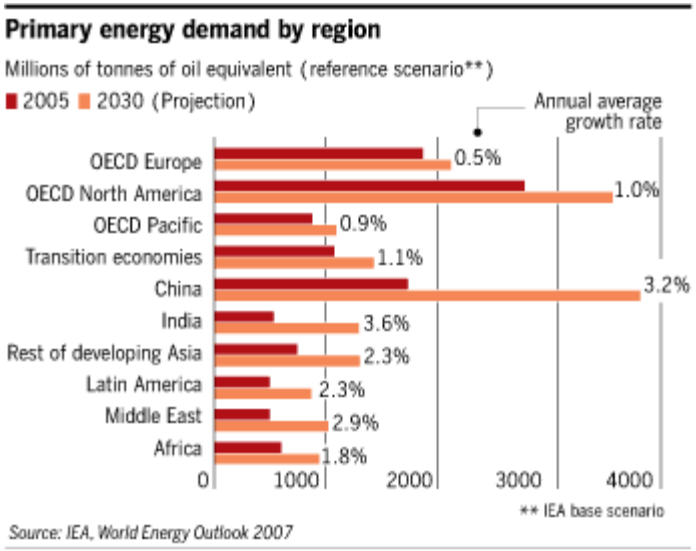




Fuel Share of World Primary Energy Supply

80% of the present global energy market demand is satisfied by fossil fuels, 6.5% by nuclear plants and 13 by renewables.



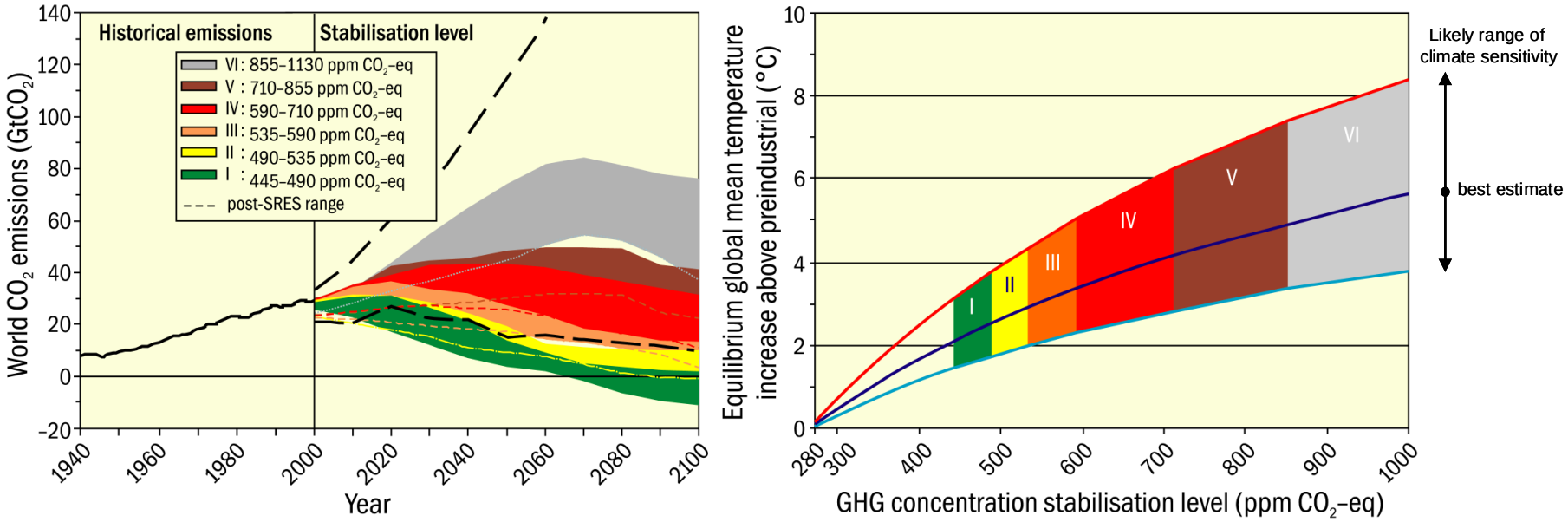
World's energy consumption is projected to expand by 60% by 2025. Two thirds of this increase will be produced by emerging countries, in particular Asian countries. Source : IEA 2006

The present energy paradigm

- The present energy paradigm is posing a serious threat to the ability of future generations. Most of the energy chain – from the extraction of resources to the provision of energy services – produces pollutants, waste and emissions. Moreover, this paradigm is mainly based on finite resources.
- Fossil fuels combustion is responsible for urban pollution, regional acidification and global climate change. According to WEC 2007, energy-related emissions (including energy used in transportation) account for over two thirds of anthropogenic greenhouse gas (GHG) emissions and contribute well over 80% of worldwide emissions of CO2.
- Nuclear power involves a great number of concerns related to the safety of nuclear installations, disposal of radioactive waste and nuclear weapons proliferation.

The challenge (threat) of Climate Change

Scenarios of world CO^2 emissions and global mean temperatures increase



Source: IPCC 2007

Sustainability:
"We do not inherit the earth from our ancestors, we borrow it from our children" (Ancient Indian proverb)

- Reformulating the Brundtland definition of sustainable development specifically for energy, "sustainable energy" results as: "The provision of energy such that it meets the needs of the present time without compromising the ability of future generations to meet their own needs"

- WEC's 3A's criteria for defining and achieving a sustainable energy future : Accessibility, Availability and Acceptability.
  They reflect the critical issues which global sustainability must resolve – i.e., 3 P's Population, Poverty and Pollution.

- Closed cycle sustainability definition: "Zero consumption is a necessary condition for sustainability, and brings about as a side effect the highly desired "zero-waste" result." (Orecchini, 2007)

Transitions towards sustainability

- **In order to implement a transition to a sustainable energy future, three solutions in three different steps should be supported:**

1. **A short - term solution based on Energy Efficiency and Integration of low carbon technologies and RES,**

2. **A mid - term solution based on low carbon technologies and RES integrating green electricity and hydrogen aiming at zero emission.**

3. **A long - term solution based on zero consumption – zero waste model**

G8 University Summit 2008: Sapporo Sustainability Declaration

- From Point 3: The role of universities
  - "All universities have an important role in problem-solving to bequeath a sustainable world to future generations."
- From Point 4: The need to restructure scientific knowledge
  - "(..) the development of a truly comprehensive vision of a sustainable society will require new scientific knowledge, restructured to reverse past tendencies toward stratification and fragmentation in research, and to foster an integrated approach to solving problems by accelerating inter-disciplinary research activities."
- From Point 5: The need for a network of networks
  - "Essential to such a framework is the creation of a "network of networks" (NNs) that links the various discipline-specific research networks already in place, thereby utilizing and augmenting their respective strengths and knowledge bases."
- From Point 7: The role of higher education for sustainability
  - "Universities have a critical role to play in educating future generations, disseminating information about sustainability, and particularly by training leaders with the skills to solve regional and local problems from a global and interdisciplinary perspective. "

Session expectations: to open the pathway at epistemological and ontological contributions to Sustainability Science with focus on energy:

Theory: Principles, Definitions, Indicators

Scenarios

Possible solutions: Technologies, Consolidated experiences, Policy Recommendations

Below is a quote from Bobby Kennedy on what the Gross National Product means and, more importantly, what it does not mean. He would have a made a fine economist...

- **"Too much and too long, we seem to have surrendered community excellence and community values in the mere accumulation of material things. Our gross national product ... if we should judge America by that - counts air pollution and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors and the jails for those who break them. It counts the destruction of our redwoods and the loss of our natural wonder in chaotic sprawl. It counts napalm and the cost of a nuclear warhead, and armored cars for police who fight riots in our streets. It counts Whitman's rifle and Speck's knife, and the television programs which glorify violence in order to sell toys to our children.**

- **Robert F. Kennedy Address, University of Kansas, Lawrence, Kansas, March 18, 1968**

Below is a quote from Bobby Kennedy on what the Gross National Product means and more importantly what it does not mean. He would have a made a fine economist…

- "Yet the Gross National Product does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages; the intelligence of our public debate or the integrity of our public officials.
- It measures neither our wit nor our courage; neither our wisdom nor our learning; neither our compassion nor our devotion to our country; it measures everything, in short, except that which makes life worthwhile. And it tells us everything about America except why we are proud that we are Americans."

- Robert F. Kennedy Address, University of Kansas, Lawrence, Kansas, March 18, 1968

- "Today I'm announcing the first steps on our journey toward energy independence, as we develop new energy, set new fuel efficiency standards and address greenhouse gas emissions. . . :

- First we must take bold action to create a new American energy economy that creates millions of jobs for our people.

- Second, we must ensure that the fuel-efficient cars of tomorrow are built right here in the United States of America. . .

- Third, the federal government must work with, not against, States to reduce greenhouse gas emissions."

President Obama's Energy & Climate Change Directives, 26/01/09

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THANK YOU FOR YOUR ATTENTION

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