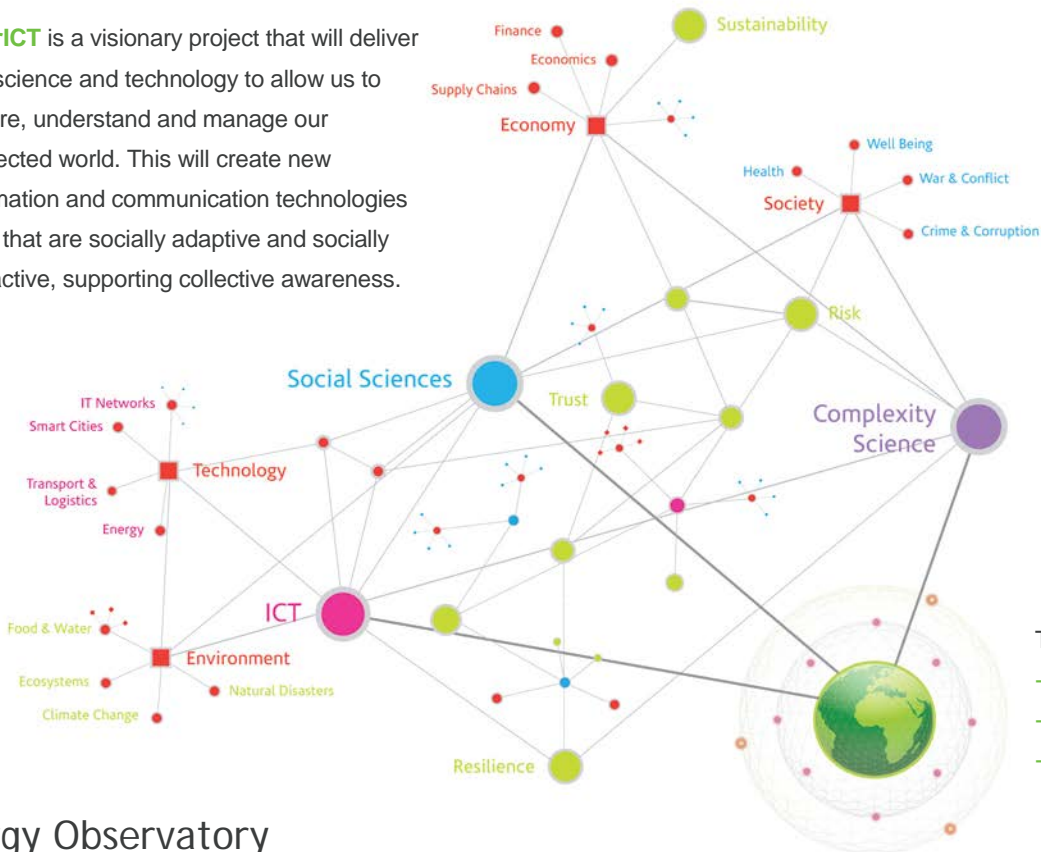**FuturICT** is a visionary project that will deliver new science and technology to allow us to explore, understand and manage our connected world. This will create new information and communication technologies (ICT) that are socially adaptive and socially interactive, supporting collective awareness.



The FuturICT Platform:
- Planetary Nervous System
- Living Earth Simulator
- Global Participatory Platform

## Energy Observatory

FuturICT will build a sophisticated framework for simulation, visualisation and participation, called the FuturICT Platform. A suite of models forming the Living Earth Simulator will power Observatories to detect and mitigate crises plus identify opportunities in specific areas. Energy is one of those strategic areas on which the global FuturICT platform will operate.

The world energy demand is projected to increase by 50% from 2005 to 2030, mostly due to the rapidly growing economies of the highly populated countries. The cost of energy obtained from fossil sources is projected to increase accordingly, due to this increasing demand. Fossil fuels (i.e. oil, gas, and coal) currently provide about 80% of the global primary energy demand. They are supplied by few producer countries, which own limited reservoirs. The first big global energetic change which will be faced by our society over the next decade is thus the transition from an economic organization relying on fossil energy to a sustainable one, based on renewable energy sources. The second big change, triggered by the recent events in Japan which caused a number of countries to rethink of their energetic policies, relates to the transition from an energetic infrastructure based on nuclear energy towards different energetic scenarios. The efficient distribution of traditional energy sources and the introduction of renewable energy ones are expected to be central problems for our economy with a number of societal challenges.

# The Global Energy Network

The response to the energy shortage and global warming is leading to the emergence of a global energy network mostly fuelled by renewable sources, which is expected to become the new world wide web of the coming decades. It will modify the way we use, transform and exchange energy. More importantly, like the internet, it will affect our culture, society and economy. According to Jeremy Rifkin, President of the Foundation on Economic Trends in Washington DC, *"We are on the cusp of a Third Industrial Revolution …The first Industrial Revolution brought together print and literacy with coal steam and rail. The second combined the telegraph and telephone with the internal combustion engine and oil. What we have now is the distributed energy revolution. We can all create our own energy, store it, and then distribute it to each other. Twenty five years from now millions of buildings will become power plants that will load renewable energy. We will load solar power from the sun, wind from turbines and even ocean waves on each coast. We can also make the power grid of the world smart and intelligent…"*

# FuturICT to facilitate and manage the upcoming Global Energy Era

The quantity of solar energy falling on the earth's surface every hour could provide 100 percent of the entire world's energy needs for an entire year. In particular, the North Africa and Middle East deserts receive more energy from the sun every 6 hours than humankind consumes within a year. The DESERTEC concept aims at promoting the generation of electricity in Northern Africa and the Middle East by using solar power plants and wind parks and the transmission of this electricity to Europe. In other areas of the world, the wind provides continuous waves over the ocean surface, transferring considerable amount of energy. Devices can now extract energy directly from the surface motion of ocean waves or from pressure fluctuations and vortices underneath. Wind energy has just entered a new phase. Accessing wind higher up, where it is stronger and more consistent, can make energy cheaper than coal. Sources of renewable power vary considerably in different parts of the world. Therefore, our society is facing distribution rather than energy supply problems.

New paradigms for global energy network management and planning will have to be based on a multiscale cross-disciplinary view, deploying multilevel dynamical system approaches typical of Complex Systems. This will require the adoption of global protocols encompassing phenomena ruling the generation/dissipation of energy at the nano and micro scales, energy supply and demand at the mesoscales up to the mega scales of the internet and wired and wireless communication networks. The paradigm shift in the energetic scenario will allow individual energy awareness to scale up to groups and, ultimately, to the entire population of users. The possibility to learn and borrow organizational energetic schemes from other disciplines should not be surprising. Fish use the vibrations induced by the vortices generated by the other fish around them to swim in the most efficient way. If the kinetic energy of the fish is compared to their muscular energy, it can be found that fish swim faster than their muscular strength would have allowed. Opportunistic approaches to the generation and distribution of energy would not need new technologies to be developed.

The technologies for making the transformation possible are already available. The energetic solution relies on the emergence of a global energy network, which will be affected by a variety of new issues arising from the political and social impact of this upcoming global transformation. The future energetic scenario will mostly be concerned with solving problems related to distribution and security. This "New Way of Securing and Managing Energy" will need a paradigm shift in our societal organization, which will be facilitated by the FuturICT Energy Observatory.

Contacts

Steven Bishop, UCL,
FuturICT Pilot Phase Coordinator
s.bishop@ucl.ac.uk

Dirk Helbing, ETH Zurich,
Chair of FuturICT Steering Committee
dhelbing@ethz.ch

www.futurict.eu

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