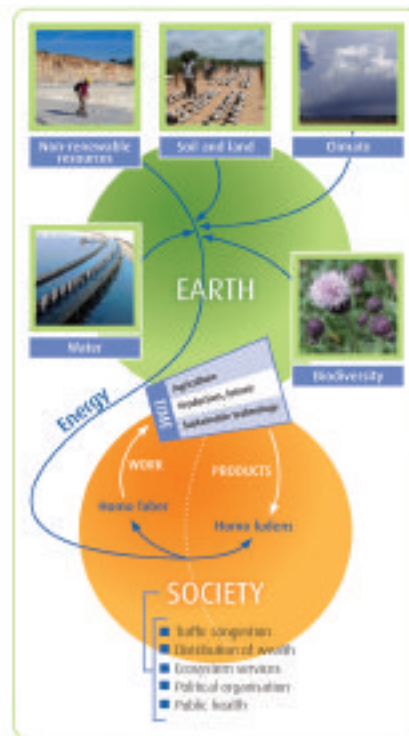


# Towards a sustainable future...

...with Leuven Sustainable Earth Research Center...

**S**ustainable technological developments are only possible when their development is based on a sound understanding of the functioning of various aspects of the Earth system, as well as of the human impact on the Earth system. Hence, solving the challenges of sustainability of the Earth-Society system requires an integrated approach. Correct scientific understanding of environmental and societal issues needs to go hand-in-hand with the development of sound technology and the study of the interactions between society, environment and technological deployment. Often, such an integrated approach is lacking. On the one hand, the impact of technological development on environmental and societal processes has long been neglected. On the other hand, environmental scientists have often taken a relatively conservative stance, perhaps overstressing the negative impacts of new technology or societal developments.

The current debate on the effects of biofuels on food provision perfectly illustrates how the implementation of a technology that was originally perceived as fully beneficial may have unexpected adverse effects when its implications for other aspects are not accounted for. Through a cascade of processes, growing biofuels may affect not only food prices, but also have important implications for biodiversity, soil degradation and water management. The complex nature of the problem requires a process of continuous interdisciplinary interaction. New technologies for a sustainable future need to be assessed thoroughly, not only with respect to their gross economic performance, but also with respect to their whole environmental and societal impact. Societal issues are of key



importance as the development of our societies will have to be guided by sustainability considerations. This requires thorough understanding of the societal impacts of technological change, as well as the development of strategies to facilitate the necessary societal transformations.

The Leuven Sustainable Earth Research Center (LSUE) is a research platform created by the Catholic University of Leuven to stimulate the integration of technological, ecological, economical and societal aspects of research for sustainable development. Developing knowledge and technology for the sustainable management of the Earth system using integrated approaches wherever possible to unravel the complex interrelationships between the various processes shaping the Earth system, technological development and societal processes is the key objective of this research centre.

## Scientific challenges

LSUE brings together environmental scientists, engineers, economists, sociologists, and legal experts to achieve a transition from disciplinary research on sustainability issues to a trans-disciplinary research strategy integrating the 'technosphere' with the biosphere. The biosphere encompasses the natural Earth system, including the climate system, biodiversity, water, renewable, as well as non-renewable resources, and the soil and land we live on. The technosphere can be seen as the activities humans conduct to survive and to create wealth: agriculture, energy generation, extraction of natural resources for production and consumption, all of which impact the biosphere. Sustainable development thus critically depends on the integration of the two spheres, which is impossible without full acknowledgment of societal processes through which the biosphere and technosphere are interconnected.

## The biosphere

There is a big need for a better knowledge and understanding of geo- and ecosystems. Understanding the fundamental processes that regulate geo- and ecosystems is a prerequisite to assess the impact of human activities on these systems, and forms a core activity of LSUE scientists. Our knowledge on many of these issues is still remarkably limited because of their intrinsic complexity. For example, our knowledge of the Earth's biodiversity is largely incomplete at best and our knowledge of key biogeochemical cycles is characterised by large uncertainties.

A thorough understanding of how geo- and ecosystems and human activities interact is necessary. Basically, this requires answering the following question: to what extent are processes and



© Wouter Achten

*Jatropha, a biofuel wonder or myth? Assessing sustainability of biofuels requires interdisciplinary research*

fluxes within the Earth system affected by human activities, and on what spatial and temporal scale are such changes taking place? Evidently, a lot of research has already been carried out with respect to this issue, but many answers remain partial and have a high degree of uncertainty. This is especially true for the less visible, but very important components of geo- and ecosystems such as organic matter and biodiversity in soils. LSUE scientists also consider important various temporal scales: archaeological research has clearly demonstrated that tendencies that are at first sight insignificant may have a determining impact on societal development in the longer run.

### The technosphere

We need to develop sustainable technologies that allow for a sustainable management of geo- and ecosystems. The fundamental question here is what strategies and technologies can be developed in order to allow satisfying societal needs in a sustainable way for developing, as well as developed, nations. Sustainable agricultural production and the provision of energy, as basic necessities for development, are key issues here. Providing quality of life improving products and services to a growing world population requires design methods, production processes and end-of-life treatment methods that are optimised from a life-cycle engineering perspective. Transport solutions and housing

facilities form important product categories in this context.

Agriculture requires special attention because of two main reasons: agriculture produces commodities that satisfy some of our most basic needs (food and fibre); at the same time, agricultural production has a large impact on the Earth system: it requires large amounts of resources (water, fertilisers, energy) and has a dramatic effect on the major biogeochemical cycles. Agricultural production is therefore one of the priorities for LSUE. At the same time, economic development is tightly related to energy production and supply. Developing solutions for both energy production and supply that can meet future global demands is a prerequisite for any sustainable development.

Although sustainable agricultural production and energy production and supply require special attention due to their far-reaching impacts, development of sustainable technology is necessary within all domains of industrial and service activity as the impact of human activities on the Earth is largely dependent on the technologies used. Choosing the best technology possible and developing new technologies keeping the sustainability of their application explicitly in mind may largely reduce our environmental footprint. The scope of this technological focus within LSUE covers important impact generating economic activities such as building construction,

transportation and distribution, consumer product manufacturing and the underlying industrial processes.

### Society

The interaction between societal systems and the environment, defined in its broadest sense, is of critical importance because sustainable development requires transition of key societal processes. The strategies used by a society in managing natural resources and technology is, to a large extent, controlled by societal processes (distribution of power, availability of information, ownership structure). Conversely, societal processes are affected by environmental issues and changes: the changing public perception of environmental issues will affect how society will function in the future. A clear example of this is the reaction of the Australian government to the current drought: this is probably one of the first times where a developed nation needs to make fundamental choices with respect to its future development in order to avoid its sustainability being threatened. LSUE promotes increased collaboration of environmental scientists and engineers with social scientists in order to assess the sustainability of technologies in a socio-economic context, and to identify the requirements for adoption of sustainable technologies in society.

More information can be found on our website.



Professor Dr Gerard Govers  
Chairman

Leuven Sustainable Earth  
Research Center  
Celestijnenlaan 200E  
3001 Heverlee  
Belgium

Tel: +32 1632 6423  
Fax: +32 1632 9760

lsue-info@set.kuleuven.be  
www.kuleuven.be/lsue