



Centre for Ecomics and
Ecosystem Management

Centre for Ecomics and Ecosystems Management

Eberswalde University for Sustainable Development

Writtle College (partnership with Essex University)



Institute of Ecology – Dept. of Soil Science

Technical University of Berlin

Ecomics as an emerging framework for ecosystem-based sustainable development

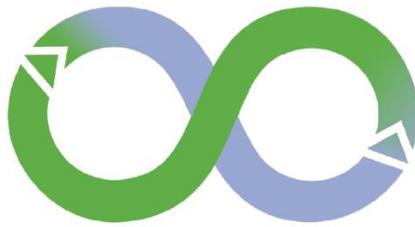
Ecosystems provide an essential template for socio-economic systems

18-19 September 2014

Programme

(version 15 Sept. 2014)





Centre for Econics and Ecosystem Management



Econics as an emerging framework for

ecosystem-based sustainable development

Ecosystems provide an essential template for socio-economic systems

at Eberswalde University for Sustainable Development - 18-19 September 2014

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The organisers

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09:40-10:00 – Presentation of the participants

**10:00 – 12:20 - Session 1 Fundamentals and general reflections about
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**10:00-10:20 - Bionics and economics: from biologically inspired technology to
ecosystem-based sustainable development**

Pierre L. Ibisch, Peter R. Hobson

Economics is an ecosystem-based theory for sustainable development. Grounded on a 'radical ecosystem approach it embraces current understanding of the order, persistence and dynamics brought about by processes defined by biological and ecological evolution. A central theme to economics is the hierarchical structure of nature created by a continual process of harnessing energy to self-assemble and build towards increasing complexity and sophistication at all levels in order to avoid entropy. Integral to nature's self-ordering process is the development of emergent properties as new networks are created and biomass as well as information grow. The extent to which matter can evolve under the influences of forcing factors is evident in the complex water and mineral cycles that drive the three main global "spheres" supporting life on earth, but are also moderated by living systems. From the original primordial soup of proteinacious matter to the emergence of a highly intelligent species capable of changing global patterns and processes, nature has

demonstrated an increasing capacity to dissipate and utilize incoming energy even during and following catastrophic disturbances, more popularly referred to as 'big extinctions'. The demonstration of resilience and adaptation bound up in the structures and processes of nature that operate within the planetary boundaries provide humans with appropriate examples of persistence and efficiency on which to create models of sustainable existence. The balanced performance between (energetic, hydric as well as material) efficiency and resilience in order to perform work and exist in a spatially limited and physically changing environment can be taken as universal definition for sustainable development. Humankind is a result of biological evolution and an embedded sub-system of the global ecosystem. Complex anthropogenic social systems are maintained by biological units, the individual humans, which depend on the functionality of the bigger system that provides energy and material required for behavioral interactions. Sustainable development of social systems, on a global scale and in the long run, cannot be achieved in ignorance of the laws of nature, or by decoupling from the wider environment and degrading the parent ecosystem. The underlying hypothesis and principle of econics state that humans and their social systems as derivatives of the global ecosystem already have an evolved set of traits contextualized to the parent ecosystem that manifest themselves in both a wide variety of constructs and behavior. If harnessed effectively and intuitively, almost all human endeavors can be exercised without breaking through ecological or thermodynamic boundaries, in other words, carried out sustainably and within the ambits of nature.

Over time the mimicking of nature in technology (bionics, biomimetics, or biomimicking) has become more sophisticated, it moved on from copying rather simple and tangible structures for more efficient constructions to imitating the performance of complex systems (e.g., swarm intelligence). The goal of bionics traditionally has been to develop more efficient and robust technological structures. Bionical templates usually are organs or parts of organisms. Increasingly, engineers also try to mimic processes and functions, for instance the development of artificial neural networks and evolutionary computation. Still, bionics takes biological systems as templates and usually seeks constructional and technological improvement. Biological systems are complex self-organizing systems on the level of organisms, individuals or populations, and bionics explores mostly physical traits that support adaptations to the environment. Contrary to that, econics concentrates on emergent properties of more or less complex ecosystems. Our understanding of ecosystems

is of self-organizing and relatively discrete systems that consist of different interacting biological systems, which, under certain given abiotic conditions, exchange and process energy, information and/or matter, thereby generating emergent properties that influence the functioning of the system and in so doing contribute to change in the system components and the abiotic environment. The positions adopted in both areas of applied research emphasize both conceptual as well as goal-driven differences.

Econics is about the economics of nature studied for the purpose of sustainable development of humankind. Both, bionics and econics, may lead to the adaptation of technology, but the motivation behind the two forms of science is distinctly different. Bionics is also less theoretical, but mainly empirical. Of course, bionical innovation may generate more efficient technology that can contribute to sustainability, but econics targets the sustainable functioning of systems itself. It is grounded on the theory of ecosystem functioning and evolution, but also derives inspiration from empirical studies.

This paper offers a first classification of econical disciplines and concepts referring to the level of abstraction (learning from ecosystems for ecosystem management as the most basic form of econics; transfer of knowledge on properties and functions to merely social or even abstract systems as the most derived one) as well as the complexities of mimicked template and target systems.

10:20 – 10:40 - Econics: Using ecosystem theory to support sustainable development in socio-economic

Andreas Hoffmeister, Felix Müller

The German term *Ökonik* originally described the idea of mimicking nature at the systems level to design a postfossil world. Since its invention in 2007 this idea has evolved to a comprehensive approach to support the necessary transformation of the global socio-economic system towards a sustainable modus operandi. Meanwhile econics, the English equivalent of *Ökonik*, covers the management of energy and matter, aspects of information handling and the development of social and economical systems. Therefore econics represents a transdisciplinary as well as an interdisciplinary scientific approach that takes its

leads from the knowledge about natural systems, particularly ecosystems, to solve real life problems.

After a short introduction about the basic ideas of econics this presentation discloses how recent developments in ecosystem-theory can contribute to key issues of sustainability in socio-economic systems. Based on orientor theory and guided by the central idea of process ecology the strategies of ecological viability are systematically examined by considering the different dimensions of the interplay of ecosystem dynamics and environmental conditions. This analysis results in the definition of 10 basic properties which on the one hand can be understood as fundamental orientors and on the other hand altogether encompass the successful viability strategies of ecosystems on planet earth.

Taking this successfulness as the key criteria for ecosystem sustainability several of the fundamental orientors are discussed in the context of their potential to provide indicators or solutions for problematic constellations and developments in the socio-economic systems. This discussion encloses (1) the general question of the implementation of solutions based on the process ecology approach as well as (2) comparisons of different strategies of anthropogenic and natural systems and (3) clear recommendations for changes in the socio-economic systems.

10:40-11:00 - Major obstacles to econical management with background in a nature-society dualism

Søren N. Nielsen

Although nature and society shares many properties we still tend to view and treat them as two quite different types of systems. This dualist view blocks for a holistic, integrated environmental management that includes knowledge of both. Such integration is necessary for a future co-existence of the systems, not side by side but inside each other. Such an environmental management in compliance with the working principles of nature we can refer to as *econic management*. It has previously been demonstrated that nature and society share many basic properties. Yet they differ in behaviour and demonstrate a performance giving the impression that they are not working from the same principles. Thus society

seems to allow sub-optimal states, a situation that rarely occurs in ecological systems. On the way to a strategy of unification of strategies for an improved management some new insights have been gained. First, both nature and society consist of systems which are ontic open. This special type of openness emerge based on quite different properties and reasons. Second, that both types of systems are governed by second order cybernetics. Both issues indicate that understanding of constraining processes must be included in management. Third, point, the inclusion of a semiotic based (re-)construction of systems may solve this issue. Meanwhile, the introduction of semiotics is not compatible with present sociological theories. The duality between humans and nature have been founded over two millenia and is hampering our possibility of forming an integrative view of society with ecology and thus the implementation of econic management.

11:00-11:20 - Coffee break

11:20-11:40 - Research & innovation have to shift towards econics

Steffi Ober

Econical science will not only have implications for theory of science. Science politics as well as research and innovations systems demand to be considered attentively. Adaptive management to integrate sustainability relevant non knowledge, uncertainty and risks calls for new kind of interaction between politics, society science and the economy. However, being pinned down in path dependencies, those new governance approaches are still in the future. Despite using sustainability in every official statement concerning Research and Innovation (R&I), research strategies are not focused on sustainability issues. 'Business as usual' keeps on running. New deliberative forms of discourse and partnership between research and society are still rare phenomena. Both sides are trapped in path dependencies and institutional lock-in. The overarching framing of growth and competitiveness is shared by most scientists, industry and politics. Not surprisingly, the German *Hightech-Strategie* as well as *Bioeconomy 2030* claims to strengthen German technology leadership in a changing world.

11:40 - 12:00 - Accounting for Economics: Valuing Biodiversity and Livelihoods in the Majority World

Sanjay Lanka, Steffen Böhm

The accounts that are used to determine the efficacy of industrial agricultural practices on the one hand, and biodiversity conservation on the other, need to be questioned. This paper looks at how the existence and preservation of biodiversity contributes to sustainable livelihoods of small farmers. It seeks to redress the absence of biodiversity in the discourse of industrial agriculture as well as the absence of livelihoods in conservation discourses by accounting for the economic practices of small farmers in the Global South. Empirically, the paper will present data collected from coffee producing cooperatives in India, Costa Rica and Nicaragua over a period of five years. We will show how 'normal', industrial coffee growing practices have led to high input costs, low yields and indebtedness, resulting in a loss of livelihood for communities as well as a loss in biodiversity. In response, these communities have adopted economic practices, which account for biodiversity, leading to improved yields, lower cost bases and improved livelihoods.

12:00 - 12:20 - Time is Honey: What does time mean for the sustainable development of ecosystems?

Manfred Stock

During the aeons of evolution ecosystems seem to have found their ways to cope effectively with various types of severe stress and disturbance. This mind-blowing finding contrasts with the impression that individual species appear quite vulnerable with respect to climate variability, natural hazards or particularly at present to various human interactions. What are the factors which might induce resilience in complex ecosystems made up of a network of various species compared e.g. to monoculture? One factor clearly identified is biodiversity defined as variability of all forms of life on all systemic and organisational levels.

Analysing the system dynamics of ecosystems, time might be a crucial factor. Different response time of different species involved could lead to a higher robustness of the network of species with respect to various disturbances. Therefore damaged ecosystems can show recovery times shorter than expected as long as significant thresholds of biodiversity loss are not exceeded. It is hypothesized that time is essential for the sustainable development of complex systems in general and of ecosystems in particular.

12:20 - 13:30 - Lunch break

13:30 - 13:50 - „Enlivenment“. Towards a First-Person-Ecology. Outline of an Anthropocene Poetics

Andreas Weber

This essay proposes a new perspective on the interplay of nature, humans and economy. It tries to develop a set of alternatives around some basic assumptions our current worldview is built upon. The position taken here will be called «Enlivenment» because its central thesis is that we have to reconsider «life» and «aliveness» as fundamental categories of thought. Enlivenment tries to supplement – not to substitute – rational thinking and empirical observation – the core practices of the Enlightenment position – with the «empirical subjectivity» of living beings, and with the «poetic objectivity» of meaningful experiences.

The current paradigm shift in the life sciences is moving away from a reductionist worldview that sees nature as a deterministic machine whose parts and processes can eventually be understood by rational, «outside» human observers, to an *enlivened* worldview that situates human beings deeply in a web of dynamic, living and unfolding creative relationships. Discarding a mechanical perspective of nature, science is beginning to see that the great, unexplored territory is the nature of life itself. Subjectivity, sentience, agency, expression, values and autonomy lie at the centre of the biosphere.

Lived experience, embodied meaning, material exchange and subjectivity are key factors that cannot be excluded from a scientific picture of the biosphere and its actors. A worldview that can explain the world only in the «third person perspective» as if everything is finally a non-living thing, denies the existence of the very actors who set forth this view. Organisms *embody* meaning and express a «world-making» sensibility. Their subjectivity and feelings of being alive are not incidental to their evolutionary history, but central to it. Enlivenment thus is an «upgrade», not a replacement, of the deficient categories of Enlightenment thought – a way to move beyond our modern metaphysics of «dead matter» and acknowledge the deeply creative, poetic and expressive processes embodied in all living organisms.

13:50 - 15:50 - Session 2: Applying economics to land use, land and urbanscapes

- Chair: Peter Hobson

13:50 – 14:10 - Agriculture, land use and the challenge of sustainability

Henry Matthews

If the world is to meet its biggest challenge in this century, the need to be able to feed 9 billion people by 2050 sustainably, then its farmers will have to work with the environment and understand natural systems. As Defra, UK, states, “*working with the grain of nature.*” The much vaunted principle of Sustainable Intensification has been proposed whereby the so called yield gap will be narrowed at no environmental or long term resource cost. While for some this only means a continuation of current practice and in Europe fulfilling the requirements of the CAP, the threat to biodiversity and the exploitative pressure on land will remain. The long term result of these pressures is the negative impact on the ecosystem services on which agriculture and ultimately the supply of food depends. Proposing potential solutions is not easy and a one size fits all approach is doomed to failure as the diversity being sought would be at risk from a monolithic approach to farm policy.

For example the system on which much of UK arable farming is based is inherently unsustainable and is already under threat from many sides including world markets, legislation and a lack of research and development into alternative inputs and systems. Stepping off the treadmill would be difficult for many and there should be no attempt to reintroduce a bucolic idyll that in itself was not economically or socially sustainable. In this case the solution could be a return to smaller more integrated units but working with nature to improve soil structure, utilising a diverse range of crops, taking advantage of precision technology while recognising the value of biodiversity and benefiting ecosystem services. The emphasis on “scaling down” the farm unit; promoting integration; use of precision technology; and diversifying, mimic certain patterns and dynamics in natural ecosystems, and in so doing, embody four core principles of ecomics. These are the observed complex connections between a diversity of components structured within holarchic levels of organisation and which are dependent on the growth of information and feedback processes to maintain persistence, resilience and adaptability. One of the biggest challenges yet to be resolved is setting limits of acceptability in the harvesting of biomass – a key factor in the persistence and regulation of ecosystems.

14:10 – 14:30 - Towards a Doubly Green Revolution through Econical Research in Agriculture

Martin Kaupenjohann, Friederike Lang

The global population which counts recently about 7.1 billion individuals is supposed to grow further by two to four billion humans within the next 40 years. The support of these humans with groceries, renewable energy and fiber requires a duplication of the global grain production.

A comparable enormous increase of production has been achieved between 1950 and the year 2000: Based on achievements in agro-chemistry, plant breeding and agricultural engineering the so-called green revolution increased the global grain production from 0,65 to 1,9 billion tons. This vast intensification of agricultural land-use, however, caused significant environmental side-effects which are visible even on the global scale. Thus,

scientists postulate a *doubly green revolution*, which considers both, intensification of the production and reduction of the environmental side-effects of agriculture.

Modern chemistry-based agricultural production facilities are progressively losing biological diversity and with that ecosystem functions like e.g. pest control. These functions are more and more externally substituted by pesticides or gene-modified resistant varieties. The sustainable functioning of such systems relies on external control, which becomes more difficult with increasing systems complexity. Thus, the technical intensification of agricultural production requires a simplification of the production system. In contrast, the stability of natural ecosystems is internally controlled and relies on diversity.

Accordingly, two rather opposing lines are followed in agricultural research to create the knowledge base to achieve the goal of increased agricultural productivity. One is relying on *technical intensification* (gene-manipulated crops, nano-agrochemicals, fertigation, etc.), one is relying on *eco-physiological intensification* (create the knowledge base for more efficient use of ecosystem functions).

We argue that increased productivity in agriculture may be achieved by learning from natural ecosystems and implementing the lessons learned into agricultural land-use systems (*economics*) as well as learning from successful historical land-use-systems (*ethno-agriculture*). In our contribution to the workshop we will exemplarily justify these hypotheses by analyzing the topics “nutrient cycling” and “diversity”.

14:30-14:50 - Coffee break

14:50 – 15:10 - “Urban Econics:” A holistic Urban Ecosystem Services Network Analysis designed for more Sustainable Pathways of Cultural Growth

Gideon Spanjar, Peter R. Hobson

Since the onset of global industrialisation the world view of nature has shifted from one of a dependency and intimate relationship with the living and non-living environment to a nature – culture diaspora emphasised by the decoupling between the urban domain and

surrounding countryside. The environmental fall-out from on-going complex interactions between an increasingly more technologically dependent growing population, climate change and the ecological degradation happening within a diminishing global biodiversity is weakening the network connectivity between biodiversity elements, which in turn is affecting ecological functions and thus reducing opportunities for the establishment of pathways for sustainable cultural growth. With little sign in the future of a fundamental reversal of the deepening environmental crisis there is an urgent need for innovative design and planning of the urban – countryside interface. Traditional architectural models, many of them prized for their individualistic character, require radical adaptation in both structure and function in order to embrace more readily nature and are able to work more synergistically with natural processes and dynamics.

Currently, conventional green infrastructure management practice appears to be inadequate in securing ecosystem services and actively promoting human well-being. This paper presents a systematic appraisal of green urban infrastructure typologies together with a detailed analysis of the interrelationships between the spatial categories and the ecosystem goods and services they provide. The findings from the case study Utrecht, reveals that analysing ecological self-regulating mechanisms in combination with pathways of cultural growth, may effectively detect vulnerable spatial configurations that undermines the promotion of citizens' well-being. Suggestions for an alternative urban design and planning strategy that reflect principles of ecomics (mimicking nature) are offered.

15:10 – 15:30 - Landscape architecture defines landscape in a spatial and dynamic design framework toward the transdisciplinary relationship with ecomics.

Jeffrey Logsdon

Landscape architecture envisions ecomics as a conceptual holistic social and ecological system thinking approach that engages in values/measures that relate to a spatial, functional, aesthetic, and process driven discipline. Ecomics realises the critical importance

toward interdisciplinary links and cross-references between science, art and design, and economics in an open systems discourse.

The intension here is to examine the meaning of landscape in its entitled realm in the theory and practice of landscape architecture, cultural geography, architecture, art, social science, and landscape ecology. The purpose is to appropriately comprehend and engage conceptual thinking into practice. To theorize and then to practice landscape architecture with the stipulation of econic theory creates an even more critical and essential system of thinking. Econics may reveal a critical unyielding quality that values, measures, and implements the economic role of social and ecological systems for planning and design. The gap exists in the process and result from taking measures (which is both a specific and holistic analysis in the broadest sense) to implementation in design practice.

The relationship is developed between the discipline of landscape architecture and econics through the meaning of landscape. The following points outlined below, include:

- Defining landscape in the interdisciplinary realm of landscape architecture
- Proposing the relationship between the meaning of landscape and the concept of econics.
- Engaging the practice of landscape architecture and econics in the process and application of elemental landscape thinking.

15:30 – 15:50 - The perception of econics from the perspective of applied silviculture

Peter Spathelf

Adaptive forest ecosystem management has to be based on a sound system understanding. There is increasing evidence, that heterogeneity and diversity of structures and functions of forest ecosystems guarantee their long-term productivity and resilience. Applied silviculture aims at the implementation of silvicultural techniques into practice in order to produce desired ecosystem goods and services in forests. Currently, close-to-nature silviculture (CNS) is the dominant silvicultural approach in central Europe and many attributes of CNS can

enhance the adaptive capacity of forests. To include adaptation into CNS, the following aspects are discussed in the paper:

- Adaptive forests primarily accept indeterminacy and uncertainty,
- Adaptive measures increase the number of development options for forests,
- Integration of stakeholder opinions increases the acceptance of measures (possibly at the expense of a measure's efficiency to cope with climate change).

15:50 - 16:15 - Session 2: Ecomics and culture - Chair: Andreas Hoffmeister

15:50-16:10 - Wild food foraging and the theory of "ecomics": bridging the nature-culture divide

Claudio Bincoletto, Anya Perera, Peter R.Hobson

Recent shifts observed in largely developed urban cultures of a re-engagement with the environment and a valuing of "nature benefits" has spawned a new paradigm of "close-to-nature" experiences such as wilderness recreation, nature watch and wild food foraging. The resurgence of "biophilic" values has been recognized and captured in several measures of ecosystem services and benefits in an attempt to raise awareness of the importance of biodiversity, not least for promoting and sustaining human wellbeing. However, there is a very real threat to an already vulnerable biodiversity of popularizing poorly designed or unregulated close-to-nature activities within a predominantly ecologically naïve urban society. The promotion of "back-to-nature" through the media and interest groups has led to the emergence of a new form of "environmental fashion", the activities of which could begin to impact in a negative way on those cherished aspects of biodiversity that maintain ecosystem function and services. The concept of ecomics is to promote the sustainable use and management of resources by learning from nature and mimicking ecosystems patterns and processes. In this study principles of ecomics are applied to practices of wild food

foraging to raise public awareness of nature values and to deepen cultural understanding of ecosystem function and the services biodiversity provides for human survival.

16:10 – 16:15 - Is there ever any space for ethics in the ecosystem?

Hartmut Ihne (not presenting, but brief announcement by Pierre Ibisch)

With the term ecosystem we describe a complex relationship between events and entities in the biosphere and the sociosphere. By now, any of these spheres, simplistically called nature and culture, has hitherto been understood properly. Even less so the interrelationships between the two. Despite this uncertainty, most ethical theories and moral standpoints do part from a disturbed balance between both spheres as a fundament of argumentation. Due to increasing irregular phenomena in the biosphere, this assumption of such a disturbance of balance seems to be assertable, but raises logical problems in the context of an ethics of the ecosystem. This contribution discusses the question if – in the light of the described uncertainty – it is ethically reasonable to argue in such a way, as well as if at all, and to what extent it is legitimate to refer natural and social systems to each other and to project them into each other. In this context it is discussed that the concept of systems, as result of cognition, is not a result of nature itself, and what can be understood as an econical imperative.

16:20 - 18:00 - Forest: walking & foraging

18:00 - 18:30 Transport to Chorin

18:30 Check-in etc.

19:00 Dinner at Immenstube

**DAY 2 – Friday 19 September 2014 – Seminar building Forest Campus
Eberswalde University for Sustainable Development**

**9:30 – 11:00 The potential of econics: econics as an emerging framework for
ecosystem-based sustainable development? group reflection about the
contents of the contributions**

Chair: Pierre Ibisch

Ca. 11:00 The way forward: networking & publishing

Chair: Peter Hobson

**Ca. 12:00 The way forward: fundraising, project proposals – identification of
potential donors and design of research ideas**

Chair: Martin Kaupenjohann/ Andreas Hoffmeister

End at about 16:00