Economics for Sustainability

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ECONOMICS FOR SUSTAINABILITY

Economic aspects play a central role in the sustainable development of economies and societies. Challenges that will be facing us in the future such as climate change, ensuring a secure supply of energy, fostering sustainable consumption, preserving biological diversity and shaping globalisation to be environmentally compatible and socially acceptable cannot be mastered without first establishing corresponding economic conditions. Economics with its expertise in evaluation methods and in the analysis of innovation processes and efficient institutions makes valuable contributions to the discourse on sustainability. It thus complements environmental engineering research and social-ecological research in useful ways. The "Economics for sustainability" funding programme of the Federal Ministry of Education and Research (BMBF) is aimed at, on the one hand, providing sustainability research vital enrichment through the use of realistic economic approaches and, on the other hand, at re-orienting economic research by focusing on sustainability policy issues.

- How can the manifold conflicts of interest that arise during the transition to renewable energies be resolved in an economically sensible way?
- How can economic incentives be used to reduce new land use?
- How can the transition to environmentally-friendly technologies be accelerated in threshold countries?
- How can environmental policy as a whole be organised to be more effective?

The 15 research projects conducted under this funding programme and introduced in this booklet are to find answers to these and similar questions and develop in cooperation with practitioners from trade, industry, the political sector, administrative bodies and civil society empirically-backed strategies for action that provide interfaces for work in other disciplines. By linking and synthesizing the research being pursued in the programme's projects and conducting its own supplementary research, an integrative synthesis project is to lay the foundation for creating an internationally visible German school of sustainability economics.

This funding programme is part of the Research for Sustainability initiative of the Federal Ministry of Education and Research.

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CONFLICTS OF INTEREST OVER BIOMASS

Renewable resources and land use – Integration of bioenergy into a sustainable energy strategy (NaRoLa)

Growing importance is being attached to biomass in connection with energy security and climate protection. However, conflicts are already emerging in association with the growing amount of land being dedicated to cultivating biomass and the macroeconomic effects of such land use. This project will analyse the contribution that biomass makes to ensuring a sustainable energy supply and assess it from an economic, ecological and social standpoint. An integrated modelling system will be developed that is able to depict the competition between biomass and food production over land use and additionally take into account macroeconomic and international feedback effects.

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CONFLICTS OF INTEREST OVER WIND POWER

Strategies for sustainable land use in the context of wind power generation (FlächEn)

The aim of this project is to reduce conflicts between wind energy use and environmental protection objectives (such as nature conservation and landscape conservation) which are currently emerging due to the fast growth in the number of wind power plants.
Wind energy's share of primary energy consumption in Germany is expected to triple by the year 2020. At the same time however, the number of potential sites for the generation of wind energy will become smaller and smaller should the current trend seen in regulatory practice continue. In order to identify suitable areas for wind power plants, the project will develop an economic-ecological model that ascertains on a well-founded basis and weighs the societal costs for setting up wind power plants at various different locations. This will include conducting surveys in selected regions to determine how residents assess the negative effects of wind power plants.

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THE PRICE OF WATER

Global water resources assessment using dynamic optimisation

The aim of this project is to assess global water resources, analyse future competition over water use and, based on this, develop recommendations for political measures that target sustainable water use.
To achieve this, the project will develop a model framework that incorporates hydrological processes plus the conditions that determine water availability and use into an economic optimisation model. This model will then be used to analyse how land use and water resources are affected in global scenarios for future economic development and climate change. Adaptation responses – such as increased efficiency and changes in the demand for food production or energy production - will also be taken into account.

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AN INTACT NATURAL ENVIRONMENT AS INSURANCE

Sustainable use of ecosystem services under uncertainty

People benefit from nature in many ways – for example, from the natural cleansing and regeneration of air, water and soil, or from the control of pests and pathogens through natural mechanisms. The use of natural ecosystems (ecosystem services) has, directly and indirectly, an enormous economic importance that is not understood in its entirety even today. This project is examining if and to what extent intact ecosystems can act as 'insurance' for their users by buffering and lessening unforeseen fluctuations such as the development of new diseases or changes in the climate. The economists and ecologists working on this project are therefore examining in particular the interaction between ecological uncertainty, the socio-economic mechanisms at work in dealing with uncertainty, and the ways ecosystems are used and managed. Taking the pastoral use of selected areas in Namibia as the focus for its study, the project aims to identify basic principles for the sustainable use of ecosystem services and, based on this, develop policy recommendations for corresponding management systems.

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SUSTAINABILITY POLICY

The concept of 'stocks' as a decision-making aid for sustainability policy

Political measures for ensuring sustainable development must take into account various factors such as climate, biodiversity, existing industries, energy supply, transport systems, types of settlements, the demands of people, organisations, institutions, laws and much more. Particular attention must be paid to the momentum or inertia of existing structures of this type. These factors, their dynamics and interaction are however virtually incalculable on a long-term basis. As a result, sustainability policy is actually a dynamic development process that unfolds against a backdrop of extreme complexity and uncertainty and a vast lack of knowledge. A comprehensive operational foundation that puts stakeholders and scientific advisors in a position to connect sustainability policy at conceptual and systematic level to the complexity of reality has been lacking to date. The aim of this project is to make important innovative contributions to the development of an operational methodology for a successful sustainability policy. An interdisciplinary theory will be developed that will enable the assessment of ecological, economic and social interrelations in time-related terms such as their inertia and their change dynamics. This theory will be based on an expansion of the concept of 'stocks' which the project will also apply to immaterial structures such as institutions and preferences.

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ECONOMIC INCENTIVES FOR REDUCING THE USE OF NEW LAND FOR URBAN GROWTH

Simulation of a land development rights trading system with the participation of municipalities (Spiel.Raum)

Historically, residential and commercial development and transport infrastructures have continually claimed new land in Germany. In an effort to address this environmental problem, there has been a search for some years now for sustainable strategies to reduce additional land use to lower levels – at the lowest possible overall cost. Various economic instruments that have been proposed range from taxes on new land use to a system of tradable certificates. The Spiel.Raum project is simulating the interaction between market participants and examining how tradable certificates act as incentives, how the system can be progressively refined, and how it differs from, for instance, emission certificates for carbon dioxide. The focus of this research will be on economic questions such as the efficiency of actual market performance and on analysing the behaviour of the 14 participating municipalities.

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OPTIMAL REDUCTION OF AIR POLLUTANTS

Development of an integrated assessment model for a national emissions management system (Otello)

This project is developing a model that will help the political sector make better decisions than in the past regarding long-term measures that could lastingly reduce emissions of air pollutants – such as sulphur dioxide, ammonia, nitrogen oxide, particulate matter – and of greenhouse gases. To ensure that the principle of sustainability is fulfilled, long-term economic factors and burdens are also to be examined and incorporated. The model will cover the period up to the year 2020. It will link technical and non-technical measures and take into account the primary sources of these pollutants (energy production, industry, transport, private households and agriculture). It will allow the integrated assessment of emission reduction measures, taking into consideration the interaction between economic, ecological and social factors. The project will model development of air quality for a region – for example, the greater Stuttgart metropolitan area – on the basis of air quality development in small areas.

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HOW DO COMPANIES INVEST?

Agents' long-term investments in the context of climate and energy (ALICE)

Recent findings in behavioural economics show that the behaviour of real persons deviates significantly from that of the so-called homo economicus in economic theory. Well-known examples of this are time preferences and overconfidence in one's own capabilities. This project will examine whether the decisions taken by companies also exhibit such deviations from theory. It will specifically conduct an empirical study of long-term investments in the electricity sector. Such investments play an important role in the development of climate protection strategies. The aim of this project is to use its empirical findings to improve assessment models which are key to the development of well-founded recommendations for climate policy.

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THE USE OF ENVIRONMENTAL CRIMINAL LAW AS AN ENFORCEMENT TOOL

The example of German environmental criminal law (ECOCRIME)

Germany was one of the first countries to apply criminal sanctions to environmental offences. German environmental criminal law was first established in 1980 and the debate on its merits continue to this day. The ECOCRIME project is making an empirical and theoretical contribution to this debate. The aim of this project is to gain an understanding of whether criminal sanctions actually help achieve sustainability goals. This work focuses on the regulatory realities involved in the practical implementations of criminal sanctions. A related issue is what contributions an improved system that draws on empirical evidence and modern regulatory literature could make. Using applied theory and econometric analysis, this project is examining existing regulations, their application in day-to-day practice, and alternative enforcement systems. In the process, the ecocrime project will make use of, inter alia, extensive criminal, prosecution and judicial statistics.

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CATCHING-UP PROCESSES IN THRESHOLD COUNTRIES

Integrating sustainability innovations into catching-up processes (ISI-CUP)

Sustainability innovations are particularly important for the catching-up process in threshold countries because global sustainability goals can be reached only when environmentally-friendly technologies are used in these fast-growing economies. Further, sustainability innovations can make an important contribution to the catching-up process when the countries undergoing this process also become providers of clean technologies on the global market. This project will examine at conceptual and empirical level the leeway for shaping sustainability innovations. Based on its findings, it will then draft recommendations for technology and environmental policy action and for the development of a regulatory regime. Technology and country profiles will be also developed in order to determine from them the conditions necessary for integrating sustainability innovations into the respective country's national catching-up process.

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INNOVATIONS FOR SUSTAINABLE DEVELOPMENT

Creation, diffusion and impact of sustainability innovations

The guiding principle of sustainability demands long-term and far-reaching changes in technology, infrastructures, lifestyles and institutions. Innovations and their diffusion are expected to provide vital stimulus for managing sustainability. Economic and sociological research conducted in this thematic field in Germany to date still exhibits a number of key deficits: For example, various interesting concepts continue to exist side-by-side but largely isolated from and unconnected to one another. Further, the connection between the development of economic theories and their empirical implementation is still relatively loose. This project will use methods of modern micro-econometrics and spatial econometrics to analyse the spatial, temporal, structural and political implications of sustainability innovations. Extensive company surveys will be conducted for this purpose. Cross-industry surveys will first be conducted in Germany. These will then be followed by sector-specific, cross-border surveys. Using special econometric methods, the project will differentiate between environmentally innovative enterprises and enterprises that are not environmentally innovative. Taking into account the endogeneity of the decisions to develop environmental innovations will be of particular importance here. Only after this has been done will it be possible to conduct an informative impact analysis of the different types of companies with respect to their environmental-economic performance.

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CONSERVING RAW MATERIALS

Actor-based modelling and steering of material stream innovations (AMOSS)

Working with the example of used tyres and the plastics used in the automobile industry, this research project is examining the extent to which and the boundaries within it is possible to reduce raw material consumption and associated pollutant emissions. In light of the dynamic growth of modern industrial and service societies, this research revolves around substance-related recycling and closed-cycle strategies. This project will analyse in particular how, on the one hand, existing technology-based potential for conservation could be expanded and, on the other, how such potential could be utilised for the groups of actors concerned through the use of material flow innovations. This work will then consider not only the potential and behaviours of the actors (for example, aims, attitudes, level of knowledge) but also the institutional and legal conditions that act as drivers for / obstacles to such innovations. These aspects will be examined with the help of a simulation model that makes it possible to portray changeable constraints on the actors' actions and show the interaction between the actors (multi-agent system).

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OVERCOMING OBSTACLES TO SUSTAINABLE CONSUMPTION

Paths to sustainable consumption – Energy, nutrition (Wenke²)

How can sustainable consumption patterns - such as the use of products that protect the climate, are produced ecologically and regionally or are bought and sold using 'fair' trading practices – be disseminated to an even greater extent than in the past?
This project will examine five different economic approaches (behavioural economics, the agent-based approach and the naturalistic approach of evolutionary economics, interaction economics and the culturalistic approach) to determine the extent to which they could contribute to understanding and dismantling obstacles and to boosting acceptance of corresponding consumer behaviour. Household energy consumption' and 'nutrition' were selected as focal areas for studying these approaches. The project sees opportunities and approaches for possible change, particularly in collaborative activities between the actors involved on the supply and user sides. This will contribute to the actors agreeing upon mutual objectives, communicating about different expectations and interests and arriving at coordinated strategies for change in the direction of 'sustainability'.

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CHANGING LEISURE-TIME MOBILITY ON A LASTING BASIS

Change dynamics in consumption and sustainable innovation paths. A study using the example of leisure-time mobility (DynamiKon)

This project examines the question of the conditions under which alternatives to cars as the most-used means of transport in the area of leisure-time mobility would be attractive. How do changes in price structure affect consumer behaviour? What influence do attitudes and level of information have in this context? Under which conditions will individuals seek alternatives to their previous behaviour patterns and thus become innovative? Using a computer-aided multi-agent system, the project will simulate and test possible developments in leisure-time mobility on the basis of important parameters such as price, information and attitudes, for selected areas. Based on this information, the project will then develop recommendations for strategies for action with the focus on sustainability.

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DECISIONS INVOLVED IN PURCHASING A CAR

The transition to new energy sources in passenger car traffic: An economic analysis for Germany (ECO-CARS)

This project is examining the economics of sustainable consumption in automobile transport in Germany. The aim of this project is to ascertain the reasons for the decision to buy a passenger car. On the basis of this information strategies that will trigger and spread more sustainable consumption styles will be developed. Looking at the use of passenger cars, the project will therefore examine – from an economic standpoint – new sources of energy such as hydrogen, natural gas, electricity and biodiesel. These energy sources might in the long term offer higher levels of energy efficiency in automobile traffic and have enormous potential for reducing environmental damage. This project will examine why passenger cars that use these alternative sources of energy and, particularly, cars that offer a higher fuel-efficiency standard have not found greater acceptance among consumers to date. This will entail, inter alia, conducting a nation-wide survey of households which will provide the basis for econometric and microeconomic analyses that take into consideration externalities such as pollution, network effects and R&D spillovers.

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BUILDING BLOCKS FOR SUSTAINABILITY ECONOMICS

Synthesis research

This research project was set up to exploit the synergies in the WiN funding programme with the aim of developing and strengthening an internationally visible school of sustainability economics. It links the conceptual research work being conducted by the individual projects under the WiN funding programme and consolidates it into generalisable 'building blocks for sustainability economics'. Drawing on this research, synthesis research identifies conceptual synergies, supports joint conceptualisation and, when necessary, discusses the potential for conflict between projects in cross-project forums such as newsletters and workshops. Synthesis research supports the intermeshment of projects through reflexion on the subject, methods and findings from the project research, while at the same time fostering internal and external communication and the transfer of findings. 'Building blocks for sustainability economics' are ascertained on the basis of the research findings generated through the funding programme, taking into account current developments in national and international sustainability-related economic research.

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PROJECTS AND PROJECT PARTNERS

Renewable resources and land use – Integration of bioenergy into a sustainable energy strategy (NaRoLa)

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Federal Agricultural Research Centre / Dr Gömann
University of Bonn / Professor Dr Holm-Müller

Strategies for sustainable land use in the context of wind power generation (FlächEn)

Helmholtz Centre for Environmental Research – UFZ / Dr Ohl
Technical University of Berlin / Professor Dr Hartje

The price of water: Global water resources assessment using dynamic optimisation

Potsdam-Institute for Climate Impact Research (PIK) / Dr Lotze-Campen

Sustainable use of ecosystem services under uncertainty

University of Lüneburg / Professor Dr Baumgärtner

The concept of 'stocks' as a decision-making aid for sustainability policy

Helmholtz Centre for Environmental Research – UFZ / Dr Schiller
University of Greifswald / Professor Dr Ott
University of Heidelberg / Dr Jöst

Simulation of a land development rights trading system with the participation of municipalities (Spiel.Raum)

Fraunhofer Institute for Systems and Innovation Research / Dr Walz

Development of an integrated assessment model for a national emissions management system (Otello)

French-German Institute for Environmental Research (DFIU) / Professor Dr Rentz

Agents' long-term investments in the context of climate and energy (ALICE)

University of Oldenburg / Professor Dr Siebenhüner
Potsdam Institute for Climate Impact Research (PIK) / Dr Edenhofer

The example of German environmental criminal law (ECOCRIME)

University of Heidelberg / Professor Dr Göschl

Integrating sustainability innovations into catching-up processes (ISI-CUP)

Fraunhofer Institute for Systems and Innovation Research / Dr Walz
Technical University of Berlin / Professor Dr Blind

Creation, diffusion and impact of sustainability innovations

Ifo Institute for Economic Research / Professor Dr Egger

Actor-based modelling and steering of material stream innovations (AMOSS)

University of Kassel / Professor Dr Beckenbach

Paths to sustainable consumption – Energy, nutrition (Wenke²)

University of Oldenburg / Professor Dr Pfriem
Dresden University of Technology / Professor Dr Lehmann-Waffenschmidt
Max Planck Society for the Advancement of Science / Professor Dr Witt

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Lausitz University of Applied Sciences / Professor Dr Zundel
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The transition to new energy sources in passenger car traffic: An economic analysis for Germany (ECO-CARS)

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