



EUROPÄISCHE AKADEMIE

zur Erforschung von Folgen wissenschaftlich-technischer Entwicklungen
Bad Neuenahr-Ahrweiler GmbH

Direktor: Professor Dr. Dr.h.c. Carl Friedrich Gethmann

NEWSLETTER

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EDITORIAL

■ With the presentation of the projects “Responsibility for Future Generations”, “Pharming” and “Fuel Cells”, the academy projects of the first generation after the “bound project financing” have been successfully completed. The view is therefore focused on the new projects. So far, several new projects with interdisciplinary working groups have been applied for.

The project “Energy Storage Systems and Virtual Power Plants for an Efficient Integration of Renewable Energy Systems” (funding: German Aerospace Center, Cologne) pursues the aim to develop well-founded and realisable proposals for the further development of regenerative energies using trend-setting accumulator and control technologies by taking into account a long-term foreseeable demand in energy and environmental quality in Germany and Europe. With the topic “Deep Brain Stimulation in Psychiatry” (funding: VW-Stiftung, Hanover) an interdisciplinary group is going to examine in which way recognized standards of research and practice in psychiatry need to be modified in order to account for the special requirements of deep brain stimulation. Furthermore, the project “Radioactive Waste – Technical and Normative Aspects of its Deposal” (funding: VGB, Essen) will focus on ethical, legal and economical questions. Moreover, the academy was assigned to participate in an umbrella project of the Federal Ministry of Education and Research on the protection of endangered bridges and tunnels for road traffic.

The Newsletter will regularly report on the current and the approval of upcoming projects of the academy.

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FOCUS

Operationalising Efficiency and Sustainability for the Evaluation of Energy Technologies

Bert Droste-Franke

Since it has become clear that economic activities can have large impacts on the environment, several discussions arose on the introduction of socio-economic aspects into welfare optimisation and on concepts which should help to realise a just intra- and intergenerational distribution of means. On the other side, a great number of indicators have been compiled, often missing the link to theoretical foundations and concrete instructions on how to be applied for decision making. This focus outlines a way to link indicators for the evaluation of complete energy systems and individual energy technologies to the general macroeconomic aims of an efficient allocation and a just distribution of means.

■ Current discussions in science, politics, and society about climate change, environmental pollution, free access to electricity grids, and resource availability reveal the major challenges for future energy systems. The goals of the energy supply systems are often expressed as a triangle containing supply security, cost-efficiency, and environmental compatibility. The variable aspects of these terms, especially those of the environmental compatibility, can be well conceived by starting from the two basic macro-economic aims of adequate assignment of scarce means to given purposes (socio-economic efficient allocation) and to individuals (just intra- and intergenerational distribution). Environmental burden plays a specific role, because human activities can have strong feedback via them to economy as well as to society, and limits at which environmental burden becomes critical are given by nature, while they are not fundamentally changeable by human beings.

Starting from the two aims of adequate allocation and distribution, in the following an operational action rule is derived which can be filled with contents in order to set up a list

of indicators for the evaluation of energy technologies with respect to their contribution to a future energy supply.

Socio-economic efficient allocation

While efficient allocation and the related aspect of welfare optimisation is a basic subject of traditional economics, concepts to consider socio-economic aspects like environmental impacts have been seriously developed since the beginning of the 1970s. The estimation of specific socio-economic effects is still subject of current research activities. The aim of welfare optimisation is to reach an optimum called a ‘Pareto Optimum’ in which no-one can be made better off without making someone else worse off. Theoretical elaborations in welfare economics showed that a market equilibrium does not correspond to a Pareto Optimum, if not all relevant aspects are considered in the market. For instance, if pollution of the environment leads to impacts which are not paid for by the originator, he will pollute the environment to a larger extent than it was efficient. The major task in this area is to analyse such market imperfections and to apply eco-

conomic instruments like taxes, subsidies, etc., to remove them to the largest possible extent.

Just intra- and intergenerational distribution

The normative statement about a just distribution must be given by society. The most widely accepted definition of the aims for a resource management supporting a just intra- and intergenerational distribution was formulated in 1987 by the Brundtland Report which claimed for a “sustainable development” defined as a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Since the 1970s several concepts have already been developed concentrating on sustaining natural and produced resources as basic requirements for future human beings to “meet their needs”. A major trigger for economic modelling activities which resulted in the development of the concept of ‘Solow-Hartwick sustainability’, often also named ‘weak sustainability’, was the Club-of-Rome Report “Limits to Growth”. Following the concept, the income of society can be kept constant over time, if the adequately assessed value of the capital remains at least constant. One main criticism of the concept of the ‘neoclassical environmental economists’ was the basic assumption of total substitutability between all forms of capital.

Contrary to the ‘neoclassical environmental economists’, the ‘ecological economists’ emphasised the importance of sustaining natural capital independently of produced capital. A major concept followed in this area, represents the idea of ‘critical natural capital’ which shows even practical relevance, if the substitutability is theoretically given, but an adequate evaluation cannot be performed reasonably. The concept of ‘critical natural capital’ aims at areas which are characterised by high risks, uncertainty, and lack of knowledge paired with effects on life support functions and potential impacts which can be restored only with extremely high effort (‘quasi-irreversibility’). In order to avoid unacceptable damage, specific capital in this area (‘critical capital’) must not be degraded and depleted above a respective critical level. Examples include biodiversity, ecosystems, ozone layer, greenhouse effect, and stock of usable land. In order to cope with ‘critical capital’, limits of burden which assure the avoidance of unacceptable consequences are derived on the basis of scientific investigations. This application of the ‘precautionary principle’ is, among others, supported by the ‘Communication from the Commission on the precautionary principle’ (COM (2000) 1). Practical examples have been realised in the area of ecosystem protection which resulted in politically fixed ‘national emission ceilings’ for substances like NO_x, SO₂, and NH₃, as well as in the area of prevention of unacceptable consequences from climate change

by setting reduction aims of greenhouse gases like CO₂. The concept of ‘critical capital’ or ‘critical sustainability’, however, does not make any statements about the management of other kinds of capital.

The discussion of ‘Solow-Hartwick sustainability’ and ‘critical sustainability’ reveals that both show significant shortcomings. In order to derive a concept applicable to all capital forms, the advantages of both views should be combined.

An operational action rule

An action rule including all aspects of allocation and distribution can be formulated by sorting the several aspects in four priorities according to the importance of the respective restrictions.

Thus, the *first priority* is to maintain life-support functions and avoid damage which can be reversed only with unacceptably high effort. For this purpose, respective limits of burden have to be derived and policies are to be implemented so that these requirements can be met at any rate. The consequences which are seen as unacceptable and, thus, have to be avoided whatever the costs are, have to be set according to rules predefined by society. Increase of knowledge in the respective areas of impact assessment and changing conditions require a continuous updating of estimates and, if necessary, of fixed limits.

Just avoiding unacceptable damage could result in only very basic resource equipment of future generations. In order to give future generations the same chances to “meet their own needs”, additionally, as regards natural as well as produced capital, further societal assets have to be maintained. For this purpose, as *second priority* the total amount of societal assets, valued on the basis of its benefit for the respective generation, has to be preserved (or increased) as far as possible. Efforts required to preserve the critical capital in the first priority have to be considered and may reduce the currently available total assets. In this case the aim is to reach an asset level which can be preserved in the long run, even if the costs which are required to avoid unacceptable damage are taken into account. In case the level is reached, further evaluated changes of all relevant societal asset components must at least add up to zero.

In order not to conserve an inefficient economic level, additionally, in a *third priority*, the welfare of the society has to be maximised inter-temporarily which means that a state should be aimed at in which no individual can be made better off without making somebody else worse off, taking into account the current as well as the future generations with the given restrictions of priority one and two. For this purpose, beside the elimination of market imperfections, political decisions should be made

on the basis of complete assessments of private and socio-economic costs and benefits.

Additionally to the inter-temporary aspects, in a *fourth priority* the present national and international distribution of means available, after having fulfilled priorities one to three, has to be organised justly by applying respective societally-defined rules.

Requirements for indicators applicable for energy technology assessment

There exist numerous lists of indicators for the evaluation of future energy systems. Three main aims which can be extracted from the lists are warranty of resource availability, protection of the environment, and just configuration of the energy supply system. These should be used in the following to sketch the characteristics of indicators required for the derived priorities. However, the discussion does not claim to be exhaustive.

In case of avoiding unacceptable damage (*first priority*), concerning environmental effects, ideally, a whole economic system has to be analysed. Otherwise, only relative statements can be made for the contribution of individual technologies to decrease pressure in a specific environmental burden like climate change and ecosystem protection. Concerning resource use, one indicator for the critical limit of the system is the time for which a resource is economically available in comparison to the time period needed to change the energy supply system to an alternative path. The first one must not become lower than the second one.

Regarding the preservation of societal assets (*second priority*) all capital losses and gains have to be evaluated adequately which is still very difficult for some forms of capital, e.g. evaluating toxic pollution of soil and water, but which can already be carried out to a certain extent. If a technology is designed to be used not only in an interim stage of the energy system, all effects of the technology, related to long-term and short-term effects, have to be considered, because they will be perpetuated with continuous technology use. For long-term effects, an increase of damage in the far future has to be adequately compensated for. In a comparison of technology options, a full cost-benefit analysis is required for areas in which they differ.

In respect of the inter-temporary welfare maximisation (*third priority*), firstly, costs are to be identified which have not yet been considered on the market (external costs) and as far as possible internalised via economical instruments. For technology comparison, as for the second priority, life cycle analyses have to be consulted. In contrast to the second priority, for long-term effects, only the sum of adequately valued damage is relevant.

Major aspects appropriate for technology

comparison concerning a just intra-generational distribution (*fourth priority*) represent the distribution of energy security and technical and environmental risks.

Conclusion

The combination of aspects of socio-economically efficient allocation and distributional justice in form of priorities opens a way to derive characteristics required for applicable indicators in the area of future energy systems evaluation. Besides, for generating new indicators, the findings provide criteria for analysing existing indicators with respect to their applicability and informative value as well as for identifying possible improvements.

Dr.-Ing. Bert Droste-Franke, Dipl.-Phys., is coordinator of the project group "Fuel Cells and Virtual Power Plants". The results of the study will be published on 9th December 2008 in Berlin.

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WORKING GROUPS

■ Project Group "Deep Brain Stimulation in Psychiatry. Guidance for Responsible Research and Application": 20–21/10/2008 in Bad Neuenahr-Ahrweiler

■ Study Group "The Restoration and Enhancement of Human Capacities by Neuronal Implants": 5–6/11/2008 in Bad Neuenahr-Ahrweiler

Deep Brain Stimulation in Psychiatry (DBS)

■ High-frequency stimulation has become the treatment of first choice for tremor associated with Parkinson's disease and other neurological disorders. Since several years DBS is now being tested in psychiatric disorders as well, because the high number of treatment refractory psychiatric patients creates a desperate need for new therapeutic options. With a kick-off meeting on 20th and 21st October 2008 in Bad Neuenahr-Ahrweiler a new project group has taken up its work whose aim is to give guidance for responsible research and application of deep brain stimulation in psychiatry. The group, funded by VolkswagenStiftung, Hanover, will run over a period of three years and is composed of leading international experts from the relevant clinical disciplines neurosurgery, psychiatry, neurology and neuropsychology as well as experts in medical law and ethics.

The project members are Professor Dr. med. T. E. Schläpfer (chair), Universitätsklinikum Bonn; Professor J. J. Fins, M.D., F.A.C.P., Weill Cornell Medical College of Cornell University, Ithaca/NY; C. S. Kubu, Ph.D., M.A.,

Cleveland Clinic Foundation, Cleveland/OH; Professor H. S. Mayberg, M.D., F.R.C.P.C., Emory University School of Medicine, Atlanta/GA; Professor Dr. jur. R. Merkel, Universität Hamburg; Professor B. Nuttin, M.D., Ph.D., Katholieke Universiteit Leuven; Professor Dr. med. V. Sturm, Universitätsklinikum Köln. The project is coordinated by Dr. phil. T. Galert, M.A., and assisted by K. Stoppenbrink, M.A., LL.M., Maître en Droit.

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Book Presentation on Chances and Risks of "Pharming"

■ On 30th October, the Europäische Akademie GmbH presented the newly published study "Pharming. Promises and risks of biopharmaceuticals derived from genetically modified plants and animals" at the Berlin-Brandenburgische Akademie der Wissenschaften in Berlin. The study is the result of the academy's interdisciplinary project "Pharming" which was conducted by an international project group of four biologists, a social scientist, an ethicist and a lawyer.

The book analyses a new field of biotechnology that uses transgenic plants and animals for the production of pharmaceuticals. The first pharming product which has gained regulatory approval is, for example, a human anti-clotting-factor produced in the milk of genetically engineered dairy goats. Besides goats, plants and other animals such as corn, rice, tobacco, cows or chicken, can be used as production platforms. Pharming is hoped to be useful for producers, patients and social security systems, since the production of some biopharmaceuticals may be cheaper, quicker, or more flexible than traditional production methods. Besides the assessment of the technology, the complex ecological, ethical, societal and juridical questions that are connected with pharming are addressed in the study. This has included an analysis of the risks for the environment and the food- and feed-chains and animal welfare considerations. Further, the views and attitudes of the public have been investigated for the first time in a comprehensive survey covering 15 countries, and moral and legal questions have been analysed. The study concludes that pharming may be a viable and potentially competitive way of producing biopharmaceuticals. However, the authors recommend a clearer regulatory framework (including common EU guidelines) and more transparency on the side of the responsible authorities. In this context, better access to information and promotion of risk research are required. It is also necessary to take into account that the current lack of

knowledge leads to a high level of uncertainty in the scientific risk assessment of pharming. Therefore, the authors recommend that pharming can only be realized with strong security measures and after a case-by-case risk-benefit assessment of each individual project.

See also the rubric "Publications".

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CONFERENCES

Global Remote Sensing Systems and Security

■ Today, satellite-based navigation systems are a permanent feature of everyday life. There are new satellite systems in the planning stage that will open up even more possibilities for earth observation, allowing for a more precise space-based sensing and detection of terrestrial structures. On the one hand, this is working to provide new potentials for a comprehensive early detection of natural or man-made risks and space-based crisis response; on the other hand, questions arise as to the quality and validity of such earth observation data and the protection of sensitive locations and institutions as well as privacy protection. Liability issues in the case of non-achievement and failure of such remote sensing security services also need to be addressed yet. Against this backdrop, the Europäische Akademie GmbH (Bad Neuenahr-Ahrweiler) in co-operation with the German Aerospace Center e.V. (Cologne) and the European Space Policy Institute (Vienna) hosted a conference on "Global Remote Sensing Systems and Security. Emergence of New Security Services?" in Vienna on 9–10 October. European experts discussed technological, societal, and legal issues arising with a view to the expectations users of satellite-based security services may have. During the panel discussion it became evident that users expect great potentials from the provision of marine services in the near future. However, such earth observation services should be incorporated into integrated security concepts, contain preventive, non-technological elements, and be fashioned in a way acceptable to both users and society at large.

Further information: www.ea-au.de/en/events/conferences/autumn-conference-2008.html

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PUBLICATIONS

Margret Engelhard/Kristin Hagen

■ Together with M. Boysen (eds.) *Genetic Engineering in Livestock. New Applications and Interdisciplinary Perspectives*, Vol. 34 of the series 'Ethics of Science and Technology Assessment', ed. C. F. Gethmann, Springer-Verlag, Berlin 2009

**Margret Engelhard/Kristin Hagen/
Felix Thiele**

■ Together with E. Rehbinder, R. B. Jørgensen, R. Pardo Avellaneda, A. Schnieke, *Pharming. Promises and risks of biopharmaceuticals derived from genetically modified plants and animals*, Vol. 35 of the series 'Ethics of Science and Technology Assessment', ed. C. F. Gethmann, Springer-Verlag, Berlin 2009

Carl Friedrich Gethmann

■ "Gerechtigkeit, Verantwortung, Vertraulichkeit" and "Ethische Aspekte von Innovationen", in: R. F. Hüttel, O. Bens, T. Pliening (Hgg.) *Zur Zukunft ländlicher Räume. Entwicklungen und Innovationen in peripheren Regionen Nordostdeutschlands*, Akademie-Verlag, Berlin 2008, pp 216–222 and 225–235 (with S. Hiekel)

■ "Gedankenexperiment", 33–36; "Gefühl", 37–39; "Geschichtlichkeit", 106f.; "Gestalt", 125; "Gestalttheorie", 125–128; "Goodman'sche Paradoxie" (with P. Schröder-Heister) 127f.; "Heidegger", 319–325; "Hempel", 345–347; "Hempelsche Paradoxie", 347–349; "Hintikka", 403–405; "Horizont", 442f.; "Ich", 497–502; "Immunisierung", 551; "Imperativlogik", 557–561; "In-der-Welt-sein", 573f.; "Indifferenz" 579f.; "Individualismus", 583–585, in: Jürgen Mittelstrass (Hg.) *Enzyklopädie Philosophie und Wissenschaftstheorie*, Bd. 3, J. B. Metzler, Stuttgart² 2008

Stephan Lingner

■ "Human spaceflight as a matter of culture and national vision", in: L. Codignola, K-U. Schrogl (eds.) *Humans in Outer Space – Interdisciplinary Odysseys*, Springer-Verlag, Wien New York

LECTURES

Bert Droste-Franke

24–25/11/2008

■ "Stationary Fuel Cells in Virtual Power Plants as Support for Fluctuating Regenerative Energy Supply"

"Third International Renewable Energy Storage Conference" (IRES 2008), Berlin

Thorsten Galert

16/9/2008

■ "Die Bedeutung des Authentizitätsbegriffs für die Ethik des Neuroenhancements" XXI. Deutscher Kongress für Philosophie, Essen

10/10/2008

■ "Die narrative Theorie personaler Identität" Workshop of the Graduiertenkolleg Bioethik, Eberhard-Karls-Universität Tübingen, Freudenstadt

Carl Friedrich Gethmann

12/11/2008

■ "Ethische Probleme autonomer Entscheidungen am Lebensende"

Hochschulgruppe der Studienstiftung des Deutschen Volkes, Universität Duisburg-Essen (Essen)

21/11/2008

■ "Ethische Probleme der humangenetischen Diagnostik"

Alfried Krupp Wissenschaftskolleg Greifswald

24/11/2008

■ "Paradigmen phänomenologischer Ethik: Husserl – Heidegger – Becker"

Workshop "Phänomenologische Handlungstheorie" (Husserl-Archiv, Universität zu Köln)

Ruth Klüser

30/9/2008

■ "Die Regulierung elektrischer Netze"

Expert Meeting "Klimaerwärmung entschärfen mit Erneuerbaren Energien aus Wüsten und Steppen", Karlsruhe

PERSONALITIES



■ Rikke Bagger Jørgensen holds a position as senior scientist and project leader at Risø National Laboratory for Sustainable Energy at the Danish Technical University.

She got her master degree and later a Ph.D. from the Københavns Universitet in evolutionary relationships, genetics and prebreeding in the barley genus (*Hordeum*). Afterwards she worked at the Risø National Laboratory as a post doc and a senior scientist. In 1990 she was employed as head of the office for gene technology and variety testing at the Danish Plant Directorate. She then returned to Risø to lead a project on risk assessment and co-existence of genetically modified plants.

She is author of more than 65 peer reviewed publications in international journals (e.g. *Nature and Molecular Ecology*) and several book chapters on aspects in relation to genetic modification, gene flow, hybridisation and risk assessment of genetically modified organisms. She has supervised fifteen students and has been responsible for a large number of externally funded projects. Bagger Jørgensen also participated in four EU projects on gene flow and risk assessment of transgenic plants (METALLOPHYTES, CONFLOW, ANGEL, SIGMEA) and served as an expert on these topics, e.g. for the Danish and European Parliament. Presently, she is editor of Environmental Biosafety Research, appointed member of the Danish Ethical Council and the Nordic Committee on Bioethics. Current projects deal with management of genetically modified volunteer plants, and effects of multifactor environmental stress on plant fitness and gene expression.

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Professor Rikke Bagger Jørgensen, Ph.D., is member of the project group "Pharming. Genetically Modified Plants and Animals as Future Production Site of Pharmaceuticals?". On 30th October, the results of the study were presented in Berlin.

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