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BOOK OF ABSTRACTS

INHALTSVERZEICHNIS

Biosphere-Atmosphere Exchange Processes

Matthias Mauder

Short presentation of the theme idea in the Future Earth context:

There is a continuous exchange of energy and matter between the Earth's biosphere and atmosphere. Many fundamental ecological and atmospheric processes are governed by exchanges and interactions through the interface between those two Earth-system-compartments. For example, about 70 – 80% of the solar energy reaching the Earth is absorbed at the surface and partitioned into various channels of heat transfer; greenhouse gases are taken up or released by microorganisms, plants, animals, humans and machines; and water vapour, the most important of all greenhouse gases, is evaporated into the air, where it can be distributed around the globe. Therefore, quantitative knowledge about the biosphere-atmosphere exchanges is essential to predict the evolution of the planet's ecosystems, weather and climate.

Biosphere-atmosphere exchange takes place in the atmospheric boundary layer, which is roughly the bottom kilometre of the troposphere that is in contact with the surface of the Earth. The principal exchange and transport mechanisms in this layer are by turbulent motion. Turbulent transport is by several magnitudes more efficient than molecular conduction. Therefore, non-turbulent transport is usually neglected when investigating biosphere-atmosphere interactions. The fact that a complete theoretical description of turbulence is not available is recognized as one of the fundamental unsolved problems of physics (turbulence closure problem). As a practical approach, semi-empirical parameterisations of turbulent transport are needed, which are based on field measurements and which require a set of more or less trivial assumptions.

The principal challenge for observation and modelling of biosphere-atmosphere exchange processes is rooted in the magnitude and range of land-surface variability. Spatial heterogeneity of land-cover characteristics and complex terrain is commonplace and occurs over a wide range of scales. Daily and seasonal cycles, modulated by weather and extreme events cause ceaseless change and non-stationarity. Spatial heterogeneity assures that exchange processes and concentration gradients commonly exhibit a complex three-dimensional structure, and non-stationarity effectively counters trends towards equilibrium in the system. Failure of observations and models to capture and account for the effects of this land-surface variability on atmospheric exchanges and concentration fields is recognized as a major source of uncertainty in regional to global greenhouse-gas assessments and climate models.

Measurements and modelling of biosphere-atmosphere exchange is often reduced to a one-dimensional system of vertical mixing. Turbulence measurements are usually conducted at meteorological towers or masts, and any interpretation of these measurements is based on an ergodic hypothesis, stating that the statistics of any sample from an ensemble (e.g., a time series) will converge to those of the ensemble itself under certain conditions. Otherwise, transport terms in all three dimensions of space need to be considered. A fourth dimension is required if stationarity cannot be assumed .

The challenges posed to biosphere-atmosphere exchange observations in real-word three-dimensional landscapes are both methodological and technological. Spatially and temporally resolving remote-sensing instrumentation, such as LiDAR, offer possibilities to address this issue. On the modelling side of the problem, Large-Eddy Simulation with much finer spatial and temporal resolution in sufficiently large domains is required. The ongoing progress in super-computing helps to cope with this challenge, but also technological innovations in efficient and effective coupling of model domains on different scales and between different compartments of the soil-plant-atmosphere system will be needed.

It is expected that this research will lead to a deeper understanding of relevant processes and feedbacks associated with the Earth's biosphere-atmosphere interaction, and will open up new avenues for modelling exchanges of heat, water and climate relevant trace gases. New findings in this area of research will likely contribute to reducing the modelling uncertainty of regional and global climate change projections.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Hierbei handelt es sich um ein Thema, das der naturwissenschaftlichen Grundlagenforschung zuzuordnen ist. Integration von Gesellschaftswissenschaften ist daher nicht zu erwarten, obwohl ein nicht unerheblichen Teil der heutigen Oberflächen-Heterogenität durch die menschengemachte Zergliederung der Landschaft verursacht worden ist. Nichtsdestotrotz, sind die zu erwartenden Ergebnisse dieser Forschung für alle Atmosphärenwissenschaften von großem Interesse, da neuartige Beschreibungen und Beobachtungsmethoden von Austauschprozessen an der Erdoberfläche angestrebt werden. Diese Prozesse sind ein wichtiger Bestandteil eines jeden Atmosphärenmodells und sie betreffen direkt die Luft, die wir atmen.

Short description about of the internationalization potential of the suggested theme idea:

International arbeiten viele Forschergruppen an Aspekten dieses Themas. Von FutureEarth erhoffe ich einen verbesserten Austausch zwischen diesen Gruppen, so dass diese Anstrengungen gebündelt, koordiniert und ausgeweitet werden können. Aufgrund des grundlegenden Charakters dieser Forschung ist sie per se internatialisierbar und die Ergebnisse sind weltweit universell anwendbar.

Global change and local threats: From coastal and marine typologies to governance

Bernhard Glaeser, German Society for Human Ecology (DGH)

Short presentation of the theme idea in the Future Earth context:

Economic costs and social hardships induced by global change, such as climate change, appear at the local level. The important decisions, activities and measures usually occur at higher, mostly the national levels. Internationally, an uneven distribution of interests, benefits and costs relating to climate change is evident. These distributional imbalances are the direct or indirect results of global climate change. We may call such an imbalance the climate divide. It occurs at different spatial and governance levels: between poor and rich continents, within the continents between poorer and richer nations, within the nations between peripheral and central regions, within the regions between affluent and impoverished or even marginalized communities and finally between households at the local level.

Developing countries have carried the main burden of global climate change which was predominantly caused by the industrial nations. At present, an increasing share of carbon dioxide is emitted by threshold countries, those countries in transition from a developing to an industrialized status, such as China, India or Brazil. The skewed distributional picture has its roots in the uneven distribution of political, economic and financial power. It aggravates the prospects for sustainable development and for sustainable and acceptable livelihoods for poor people. Climate impacts, poverty and social justice are interlinked across spatially nested, hierarchical levels. The uneven distributions of wealth can be understood as nested hierarchies which are reproduced at the various levels of the socially and ecologically organized global system, beginning at the local up to the global level.

Hierarchically organized systems can be identified when regarding the impacts of global change, climate and social aspects included. These are social-ecological systems which link the pressures exerted by climate change with social impacts for whole societies, groups or individuals. The political responses at the national or regional level labor at finding economic, social, ecological and technological solutions to meet the problems encountered. Such attempts may occur independently of whether the causal chain from drivers producing global changes via the observed or felt pressures down to the local ecological changes and social impacts has been scientifically established.

Coasts and oceans, in particular, have gained ever more importance during the last decades. Roughly two thirds of the human population live, work and produce on coasts. Oceans and coasts are major sources of food, minerals and other resources. Oceans are the "unknown planet" where a census of marine life was launched. Coasts and oceans represent a maximum of biodiversity. Coasts and oceans also represent political and economic vested interests, which produce conflicts.

I propose to study coastal and marine social-ecological environments at different scales on different levels. Scales are the space, time or governance related dimensions. Levels are located at different positions on a scale and include the global level as well as local to regional comparative case studies. The case studies should be interconnected by creating an integrating social-ecological coastal and marine typology to understand the ecological, socio-cultural and economic aspects of coastal and marine systems. On that basis, science should be linked to policy and develop a national and supra-national decision support tool. Such a process involves different levels again, on a governance scale: from local management decisions to national lawmaking and international-global governance production and producers, such as the European Union or the United Nations Organization.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

This contribution is closely related to ZMT research and the proposal submitted by Ekau, Glaser, Schlüter, Westphal "Transition in (tropical) coastal zones – The challenge of global changes to coastal social and ecological systems on regional and local scales" (DP114).
Also to Lochte, Lantuit "The Future Frozen Earth: Understanding, Documenting, Communicating and Anticipating Environmental Changeand its Socio-ecological Implications in the Arctic and the Antarctic" (DP102).
Quaas, Schmidt, Voss, Kropina, Neumann "The ocean and coastal societies: Pathways towards sustainable development" (GD302).
Padmanabhan "Deliberation on Sustainable Development Trajectories in South/East-Asia" (GD304).
These and similar contributions could cooperate.

Short description about of the internationalization potential of the suggested theme idea:

My proposal fits, among others, LOICZ and IMBER, as international collaborators. I work with both organizations. LOICZ (Land-Ocean Interactions in the Coastal Zone) is a core project of the International Geosphere Biosphere Programme (IGBP) and of the International Human Dimensions Programme (IHDP). IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) established its human dimensions working group (HDWG) in 2010.

The Future Frozen Earth: Understanding, Documenting, Communicating and Anticipating Environmental Change and its Socio-ecological Implications in the Arctic and the Antarctic

Lochte, Karin; Lantuit, Hugues

Short presentation of the theme idea in the Future Earth context:

The Arctic and part of the Antarctic are particularly vulnerable to environmental change: Warming is expected to proceed there at least twice as much as the global average by 2100, leading to substantial changes to the ecosystem. These include the shrinking of summer sea ice extent in the Arctic, the release of carbon from thawing permafrost or the melting of the West Antarctic and Greenland ice sheets. These changes are often tied into feedback loops that reinforce warming at high latitudes but also at lower ones. The absence of sea ice leads to the accumulation of heat in the Arctic and Antarctic Ocean, the increasing release of carbon stored in the permafrost through summer thaw or coastal erosion result in greater greenhouse gas emissions.

The awareness for these mounting issues at the poles among global environmental change researchers and society is rising, but it lacks an integrated understanding for the scale of changes to come for polar regions and for lower latitudes. New research issues with potentially very large impacts, such as the Arctic Ocean acidification, black carbon or permafrost thaw are not articulated clearly in this view of polar regions and need to be accounted for.

Socio-ecological interactions are particularly acute in Arctic regions. They are sparsely populated, but the drastic nature of the changes taking place leads to greater strain on local communities spread mostly along the arctic coastline. Small villages often need to cope with coastal erosion, changing wildlife dynamics, disrupting infrastructure due to permafrost thaw, prompting the need for vulnerability assessment and rapid adaptation strategies. In short, polar regions are in need of efficient early warning systems that are not necessarily trivial to justify, because of the remote and sparsely inhabited nature of the area.

The polar research and stakeholder community has been very proactive in bringing together existing strengths of researchers and other stakeholders, in particular local community (indigenous and non-indigenous) members in the circum-Arctic, and introducing traditional knowledge in an innovative and transformative research framework. It has also continued efforts and committed considerable new resources during the International Polar Year (2007-2008) to understand, document and anticipate how the polar regions and their socio-ecological interactions as well as to communicate this knowledge to the full range of stakeholders. The strength of this particular approach is rooted in transnational dimension both in the Antarctic and in the Arctic and a successful history of cooperation among industrial nations.

Polar regions are increasingly being identified as „core“ or „central“ regions of focus in international research frameworks, highlighting the pivotal role it now plays in the Earth system. The Future Earth draft initial design report qualifies the poles as „particular regions and biomes that play important roles in the Earth system or are particularly vulnerable to environmental change“. It is now time to acknowledge this theme as a founding focus for Future Earth and highlight the critical need for basic science to underpin this theme especially if we are to move towards prediction and informed management.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The German scientific community contributes substantially to the study of polar regions. Polar research is coordinated by the national committee on Arctic and Antarctic research (LA SCAR/IASC) and the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI). Research is being performed at the AWI, but also at other institutes and universities, making it one of the leading nations in the study of both the Arctic and the Antarctic. Germany also hosts several international secretariats, including the International Arctic Science Committee (IASC), the Polar Prediction Project (PPP) and the International Permafrost Association (IPA).

The German scientific community has traditionally focused on providing basic knowledge on the natural state of the Arctic and the Antarctic. It draws its strength on its logistical capacity, including its stations, icebreaker (Polarstern) and polar air planes, but also on its long-term observatories of which the HAUSGARTEN is most prominent representative in the Fram Strait. The German community is increasingly involved in the study of social dynamics in the Arctic, but also in a dialogue with local communities on partnership in monitoring. This has led to the establishment of cooperative frameworks in the western Canadian Arctic, but also to the recent initiation of efforts to understand the potential societal impact of permafrost thaw in the circum-Arctic.

The German community is also engaged in an effort to streamline its strategy for the Arctic and the Antartic. The German Ministry of Education and Research (BMBF) released a strategy for the Arctic a few years ago, building on the involvement of multiple stakeholders and the German government plans to develop a polar strategy involving several ministries in the process.

The maturity and comprehensiveness of the German community's approach to Arctic and Antarctic research are valuable assets to address the challenges facing polar regions and should contribute to make it a key player in the implementation of this theme in Future Earth.

Short description about of the internationalization potential of the suggested theme idea:

Polar research is international by nature and by law: It is a keystone of the Antarctic Treaty and a central part of Arctic Research. The remoteness of polar regions has early on prompted countries engaged in research efforts to coordinate their actions. Coordination is continuously being improved, trough organizations in which Germany is fully engaged and often plays a leading role. The International Polar Year (2007-2008) showed the value for creating an international platform dedicated to research and dialogue with stakeholders and paved the way for the development of these efforts in the twenty-first century.

Land surface processes in the climate system

HaPe Schmid

Short presentation of the theme idea in the Future Earth context:

To understand and predict the ramifications of increasing greenhouse gas concentrations on the Earth´s climate system and interactions with the biosphere, robust measurements of concentration trends and exchange fluxes are needed, together with observations of governing biogeo-chemical and biogeo-physical processes. In the global greenhouse, the terrestrial biosphere (i.e., largely soil-microbes and vegetation) is arguably the largest "broker" (acting as both source or sink) for the most important naturally occurring greenhouse gases: water vapor, CO2, methane (CH4), and nitrous oxide (N2O). Moreover, the land-surface is the most active and dynamic "hub" for the transformation and cycling of energy and water through the climate-Earth system. Biospere-atmosphere exchange processes are of particular interest, as they form the backbone of any predictive model that accounts for the source-sink behavior of the biosphere and its interaction with climate. This "broker"- and "hub"-role of the land-surface in the climate system is significantly affected by environmental stressors (e.g., drought or flooding, heat, ozone, pests, diseases), as well as by land-management practices (e.g., agriculture, forestry) and land use – land cover changes (LULCC).

To address even a limited range of essential research questions in this complex web of climatically relevant interactions at the land surface requires a broad multi-disciplinary approach, and cross-disciplinary collaboration. To address this topic comprensively, collaboration is required between specialists trained in diverse subjects, including atmospheric scientists, biologists, chemists, ecologists, geo-scientists, mathematicians, physicists, and engineers of various disciplines.

Research on this topic aims at quantifying how the ineractions of climate change and land use change affect (i) regional vs. global, and biophysical vs. biogeochemical ecosystem-atmosphere exchanges, and surface hydrology, and (ii) how the relative magnitude of these interactions varies through time.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Collaborative research on land surface - atmosphere interactions (both observational and modelling) has a long and well established tradition in Germany, and is well connected to partners in Europe and globally. In particular, a network of integrated long-term observation stations (in Euroflux, Carbo-Europe, Nitro-Europe, Fluxnet and, more recently, TERENO and ICOS) has been established since the mid 1990s. Together with closely linked modelling activities, this research continues to contribute to progress in process understanding of the role of the land surface and its biosphere in bogeochemical/ physical cycling of greenhouse gases, water, energy and reactive gases. This research has benefited from participation from all major environmental research organizations in Germany (Universities, MPG, Helmholtz, Thünen, Leibnitz).

Because large-scale land use/land cover changes (agriculture, forestry, urbanization) have substantial feedback links with biogeochemical/physical cycles, and the availability of ecosystem resources (water, energy, carbon, nitrogen...), projections and predictions of future ecosystem developments, and the assessment of climatic ecosystem services, must include socio-economical practices and decision-making catenae (e.g., by agent-based modelling). Thus, this topic is at the cusp of integration between natural- and social-sciences. At this time, only the beginnings of such integrative work have started to emerge, but it is clear that true progress is immediately dependent on it.

Short description about of the internationalization potential of the suggested theme idea:

As mentioned above, research in this topic has developed into collaborative national and international networks. The topic of land surface processes in the climate system has global relevance, but it is characterized by significant regional diversity across a wide range of scales. Because observations and modelling exercises need to be compatible, and data products comparable, worldwide, this research depends critically on international collaboration, coordination, synthesis and exchange.

Urban Environment: carbon, climate, comfort

HaPe Schmid

Kurze Darstellung des Themas im Future Earth Kontext:

Das Ökosystem Stadt wird sowohl als Lebensraum des Menschen als auch als primäre Schadstoffquelle (Luftqualität und Treibhausgase) im Erdsystem immer wichtiger. Die Änderung der Ausdehnung von Städten aufgrund der demographischen Entwicklung stellt die drastischste Landnutzungsänderung im Erdsystem dar, u.a. werden weltweit 75 % der energiegewinnungsbedingten Kohlendioxidmissionen aus Städten heraus generiert. Daher muss die Rolle des Ökosystems Stadt im Erdsystem und vor allem der Austausch von Energie, Wasser, Spurengasen und Aerosolen zwischen dem System Stadt und den sie umgebenden Kompartimenten des Erdsystems besser verstanden werden. Dieses Verständnis ist die notwendige Voraussetzung für die Entwicklung von nachhaltigen Anpassungs- und Vermeidungsmaßnahmen, die vor allem in den urbanen Räumen stattfinden werden, um den kommenden Generationen angemessene Lebensbedingungen zu bieten.

Für die Erfassung des Einflusses der städtischen Entwicklung auf den Klimawandel und die Rückwirkung des Klimawandels auf urbane Umweltbedingungen (städtische Wärmeinsel, städtische Luftqualität, städtischer Wasserhaushalt, innerstädtische Böden und Vegetation) sind längerfristige Untersuchungen notwendig. Sowohl innerhalb der Stadt (beispielsweise zwischen städtischen Oberflächen und der städtischen Atmosphäre, footprint einzelner Stadtquartiere) als auch zwischen der Stadt und ihrer Umgebung (regionale Interaktion von Stadt und Umland in der Atmosphäre, Hydrosphäre, Pedosphäre und Biosphäre) sind Messungen und Auswertungen auf einer Zeitskala analog zu TERENO oder ICOS (mindestens 15 Jahre) notwendig, die so bisher noch nie durchgeführt wurden. Dabei müssen diese Vorgänge auf denen ihnen eigenen Skalen erfasst und die Wechselwirkung der Vorgänge untereinander auf den unterschiedlichen räumlichen und zeitlichen Skalen untersucht werden. Hierbei sind auch Austauschvorgänge von Energie, Wasser, Stoffen (Treibhausgasen, VOC und Aerosolen) zu berücksichtigen.

Ein Ziel in diesem Topic ist der Aufbau einer integrativen Beobachtungs- und Modellierinfrastruktur der urbanen Umwelt, die als Komponente der Nationalen Plattform Zukunftsstadt entstehen soll. Die Herausforderung ist dabei die Schaffung einer verlässlichen und langfristigen Datenbasis zur Überprüfung der Wirksamkeit von technischen und planerischen Massnahmen auf Klima, Umwelt und Lebensqualität in Stadtgebieten, die im Rahmen von Zukunftsstadt umgesetzt werden.

Urbane Umweltforschung ist die logische und notwendige Antwort für die gebaute Umwelt zu bereits existierenden Mess-und Monitoring Programmen wie TERENO (Deutschland) oder ICOS (Europa) und NEON (USA), die im Wesentlichen auf natürliche und landwirtschaftliche Ökosysteme ausgerichtet sind. Die Stoffflüsse in Städten sind heterogener als die in außerstädtischen Landschaften aufgrund des kleinräumigen Mosaiks von Ökosystemen. Dieses macht eine umfassende instrumentelle Ausstattung hinsichtlich der Messungen von Stoffflüssen zwischen Atmosphäre, Vegetation, Boden, Grundwasser, Vorfluter und den anthropogenen Emittenten notwendig. Ein solch umfassendes Vorhaben kann nur unter breiter Zusammenarbeit und Mitwirkung von vielen verschiedenen Partnern gelingen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Potenzielle Nutzer und Kooperationspartner der Arbeiten zu diesem Topic sind die nationale und internationale wissenschaftliche Community (alle Naturwissenschaften, sowie auch Epidemiologen, Gesellschaftswissenschaften, Landwirtschaft), Städte (z.B. Karlsruhe (zukünftige klimabewusste Stadt), Stuttgart (langjährige Erfahrung in Stadtklimatologie), München (diesbezügliche Experimente schon in den 80er Jahren), Berlin, Hamburg, Leipzig (aktuelle Aktivitäten in Stadtforschung)), Regionalplaner, Politiker, Industrie, Ver- und Entsorger, Gesundheitswesen.

Diese Forschung soll nicht nur an einem Standort, in einer Stadt aufgebaut werden, sondern als konzertiertes Netzwerk in unterschiedlichen Städten, um möglichst das Spektrum von urbanen Ökosystemen zu umfassen und so die prozessorientierte Modellentwicklung optimal zu untermauern. Ähnlich integrierte Ansätze zur Untersuchung der urbanen Umwelt sind bisher international nur als relativ kurze Kampagnen und in einzelnen Stadtregionen ausgeführt worden (z.B., Mexico City, Salt Lake City, Oklahoma, London, Berlin, Basel, Marseilles). Die langfristige Perspektive und ein abgestimmtes Vorgehen an mehreren Orten ist aber wesentlich, um über die Einschränkungen einer Fallstudie hinauszukommen.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Die Wissenschaftscommunity zum Thema Urban Environment ist international sehr gut organisiert (siehe International Association for Urban Climate, IAUC, http://www.urban-climate.org; Urban Flux Network, http://www.geog.ubc.ca/urbanflux/). Demensprechend ist ein grosses internationales Interesse an dieser Forschung zu erwarten. Obwohl Deutschland in den Anfängen dieser Forschung (bis Mitte 20.Jhdt) führend war, hat die aktuelle Entwicklung der naturwissenschaftlich fundierten und technisch hoch entwickelten urbanen Umweltforschung vergleichsweise erst zaghaft Niederschlag gefunden hierzulande (z.B. mit Berlin nur ein Standort im Urban Flux Netzwerk). Die Forschung zu diesem Thema findet also in erster Linie international statt; in Deutschland besteht Nachholbedarf.

The Future Digital Earth - Establishing Scientific Information Infrastructures for Sustainability Research

Lars Bernard[*#], Ralf Bill[+#], Stephan Mäs[*] (*TU Dresden; [+]Universität Rostock; [#]Deutsche Geodätische kommission, Sektion Geoinformatik)*

Short presentation of the theme idea in the Future Earth context:

In 1999 the former US vice president Al Gore coined the term Digital Earth to envision an instrument to gain seamless access to various kinds of globally distributed spatio-temporal datasets each covering different parts of the world, having different scales and resolutions and describing the state of the environment and potential environmental threads. Today, a good part of that vision became reality in a number of mostly commercially driven virtual globe applications that we use on a daily basis to virtually explore places. The enormous technological progress related to geodata acquisition, computational power, internet protocols and geodata processing allows today for usage of such applications at our desktops or even on various kinds of mobile devices. Infrastructures to share geospatial data from spatially distributed and diverse organizations form the backbone of the Digital Earth, and different types of Spatial Data or Geodata Infrastructures (GDI) can be found today (e.g. EU INSPRE, US NSDI, Eye On Earth, UN NSDI, GEOSS).

Taking the progress in information technologies and the on-going developments towards GDI and the Global Earth Observation System of Systems (GEOSS) as a starting point, Craglia et al. (2012) identify the following key challenges for the science case in a Digital Earth 2020:

- linking of multi-disciplinary models to support prediction and assessment of global change(s),
- integration of (near) real time observations taken from the fast emerging pervasive modern sensor networks, including social networks,
- consideration of policy scenarios and their potential impacts,
- communication of scientific findings on global change effects, the related uncertainties and proposed measures to scientists, decision makers and the public, meanwhile providing participatory frameworks supporting stakeholders in sharing their concerns and formulating responses and actions.

Globally, the role of scientific information infrastructures as an integral part of general research infrastructures has further been recognized and addressed in initiatives like the US NSF Earth Cube Program, European initiatives on e-Research Infrastructures. Examples of German initiatives are given by strategy papers as the 'BMBF Forschungsinfrastruktur Roadmap' or the DFG strategy paper 'Langzeitperspektiven und Infrastruktur der terrestrischen Forschung Deutschlands'. Moreover a number of (German) projects already tackle aspects and components of such scientific information infrastructures being evident for research related to all aspects of Future Earth:

- In support of the dynamic planet view different environmental observatories (e.g. TERENO, GDI-DE, PEGELONLINE…) and early warning systems (e.g. ZKI-DE) can be accessed online,
- In support of the global development view infrastructures exist to provide access to data from various simulations, scenarios and synthesis (e.g. the GLUES GDI for addressing sustainable land management research),
- In support of the global development view there are a number of dissemination and decision support tools to give a broad group of stakeholders' interactive access towards future earth related research results.

However a number of challenges remain in establishing a Future Digital Earth being understood as a system of scientific information infrastructures to support national and global sustainability research. Examples of these challenges span from the establishment of an overarching strategy and framework for such infrastructure(s), over aspects as semantic interoperability, data fusion techniques, environmental data publications and archives, linkage of environmental models towards the further inclusion of citizen science approaches.

Craglia, M. et al. (2012): Digital Earth 2020: towards the vision for the next decade. International Journal of Digital Earth, 5 (1), 4-21.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Establishing Scientific Information Infrastructures requires - by nature - cross cutting activities linking different communities and initiatives, e.g.:

- D-GEO (GEOSS)
- GDI-DE
- Implementing the INSPIRE Directive on the Federal and the Länder level
- BMBF and DFG initiatives related to research infrastructures
- BMBF FONA Program
- BMBF Geotechnologien Program
- Deutsche Geodätische Kommission
- Rat für Sozial- und WirtschaftsDaten (RatSWD)
- Gesellschaft für Informatik
- TERENO, PANGAEA, ….

Short description about of the internationalization potential of the suggested theme idea:

- Integration and linking with other global infrastructures and projects like GEOSS, GCMD, and AIMES but also regional initiatives
- Linking with activities on „e-infrastructures and data management" in the BELMONT Forum and the NSF earth cube program
- Linking with administrative initiatives as INSPIRE, EyeOnEarth,…
- Linking with Standardization (OGC, W3C,…)
- Definition of common rules and principles for the publication of environmental scientific data
- ...

Decadal mass balance of glaciers and ice caps from 2000 to 2012 based on interferometric SAR satellite data

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Short presentation of the theme idea in the Future Earth context:

Dramatic losses in the ice volume of temperate glaciers are observed worldwide during the routine quality control of TanDEM-X digital elevation models at DLR. We therefore propose a systematic analysis of these losses in cooperation with scientists from other geophysical and geographical disciplines.

Glaciers and ice caps are not only important contributors to sea level rise but they act also as water storage and supply in various regions of the planet. Our satellite based investigations will allow a global view of the development of glaciers during the last decade and thus complement conventional glaciological work which focuses mainly on studies of individual glaciers. Recent global low resolution mass estimates for glaciers and ice caps as well as studies based on optical data show significant mass deficit for many ice covered regions mainly in response to atmospheric warming. We propose to use elevation data acquired only from Synthetic Aperture Radar (SAR) systems to provide a more detailed and precise analysis over these areas. We apply the geodetic method on elevation data acquired by two similar spaceborne missions: the Shuttle Radar Topography Mission (SRTM) of February 2000 and the TanDEM-X (launched 2010). With this multitemporal dataset we accurately compute ice elevation, volume and consequently mass changes of large ice covered surfaces and we offer a consistent report on the mass change rate occurred corresponding to the period 2000 – 2012. The technique is applied over areas situated at latitudes between 60°N and 56°S (the coverage of SRTM), thus focusing on temperate glaciers which are located close to inhabited areas. Ice sheets, ice caps close to polar regions and semipolar outlet glaciers will not be included in our investigations.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

(a) Interesse der deutschen Communities:
The project is a direct exploitation of German investments into spaceborne radar technology. DLR/Germany was part of SRTM and currently is responsible for the complete TanDEM-X mission - from design to operations. The available data, processing facilities and knowledge are unique and will allow German scientists a global view on the evolution of temperate glaciers.

(b) integrativen Potentials von Natur- und Gesellschaftswissenschaften:
Glacier retreat is a process clearly undergoing in many regions of the world. Our assessment of the mass change rate can serve to understand the extent of the downwasting in relation to climate relevant factors and to predict the future development of the ice cover. This will allow the communities affected by the glacier retreat to adapt to its consequences (e.g. changing runoff, sea level rise, glacial lake outburst floods).
Our quantitative measurements of ice volume changes must be discussed with scientists from various other fields. Following activities and corresponding domains will be involved:
- comparison with in-situ measurements such as GPS, precipitation and possibly historic data (glaciology, meteorology, geography)
- assessment of the impact of ice mass loss to local society, e.g. in its function as a freshwater reservoir (technical development, GIS)
- support the global climate modeling (climate science)
- support the validation of gravity field of the Earth (geodesy)

Short description about of the internationalization potential of the suggested theme idea:

Due to its global content the topic obviously needs collaboration with international geoscience partners. Owing to its international space missions DLR already has contacts relevant for this proposal to the following organisations:

- Alfred Wegener Institut (AWI)
- Applied Physics Laboratory, Univ. of Washington, Seattle
- Bayerische Akademie der Wissenschaften, Kommission für Erdmessung und Glaziologie
- Department of Earth System Science, University of California, Irvine
- Department of Geography, Friedrich Alexander Univ., Erlangen
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Global Land Use and Resource Scarcity

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Short presentation of the theme idea in the Future Earth context:

Land use change is a major driver of many key processes and outcomes of global environmental change. Understanding the dynamics of land use change and its environmental and societal outcomes from local to global scales are therefore among the most pressing challenges of the 21st century and would further our knowledge of co-evolving natural and socio-cultural systems substantially.

Land available for agriculture is increasingly becoming a scarce resource under conditions of global change. Population growth and wider societal changes such as the widespread shift towards more meat-based diets are increasing demands for land-based products rapidly. Likewise, the increasing role of bioenergy leads to conflicts with more traditional land use, including for food production. At the same time, land degradation and climate change, alter the availability of land and conditions its potential uses. And new forms of land uses associated with new actors enter the scene, including as the protection of ecosystem services, carbon stocks, and biodiversity and various forms of indigenous values. All of this raises important questions about the potential planetary boundaries of land-based production and over the use and distribution of land.

Three main trends are particularly noteworthy in this context. First, the number and magnitude of claims to land for various purposes has risen dramatically. Demographic effects and changing consumption patterns meet new land uses and emerging markets such as those for biofuels or carbon. These changes on the demand side have multiple effects on the dynamics, modes (e.g., land expansion vs intensification) and outcomes of land use and related competition. In the light of saturating yield increases, land degradation that becomes apparent in many world regions, and increasing uncertainty due to climate change it is highly unclear whether technological innovation will help to stay within planetary boundaries without major changes in consumptive behaviour.

Second, local land use is increasingly connected to distant places through multiple and inter-related teleconnections with ecological, economic, social, political and scientific dimensions. This is not restricted to geographical scales but includes epistemic, social and political scales and pathways. Systemic effects are beyond local actors' individual knowledge and consequences from local to global decision-making thus spread through teleconnected networks, distributing material and social effects as well as responsibility for them in new ways. Where, in space and /or the commodity change this increasing connectedness of places and people increases or lessens land scarcity and the competition for land, however, remains highly unclear.

Third, rapid and intense urbanisation now occurs across the globe and we are entering what has been called the urban century. The dynamics of urban settings also drive rapid changes in lifestyles and patterns of consumption. These in turn affect not only land use in cities and along an urban-rural gradient, but also the teleconnected urban hinterlands globally. "The urban era" thus drives new patterns and dynamics of spatial transformation. How the urban era affects land scarcity and conflicts over land is not well understood though.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Research on land and resource scarcity runs across traditional disciplinary boundaries and its economic, social, institutional and normative aspects have not been grasped in their relevant complexity and in adequate relation to the biophysical components. Our integrative knowledge on the effects of land scarcity is therefore limited. This is worrisome, because this limits our understanding of the decision space that is available to navigate towards a more sustainable planet and it hinders identifying the trade-offs between different land use alternatives under global change.

The German research community reacted proactively and has become a stronghold for land system science globally. Research on socio-ecological systems and land use is systematically supported, for example, via programs such as BMBF's FONA programme on "Sustainable land management". WBGU's 2011 flagship report on a world in transition also identifies the increasing land use competition as one of the core global challenges towards more sustainability. The interest across different German research communities accordingly includes humanities, social sciences and sciences alike. Related research has already motivated new institutional settings, such as the Integrative Research Institute for Transformations of Human-Environment Systems (IRI THESys, http://www.iri-thesys.org/).

Short description about of the internationalization potential of the suggested theme idea:

Similarly to Germany's national activities, the IHDP/IGBP core project "Global Land Project" (GLP) receives great attention by the global research community. The GLP Open Science Meeting 2014 in Berlin (http://www.glp-osm2014.org) will be the global forum for land systems related research for 650 international scientists. Interest in Land System Science is increasing rapidly, not the least because socio-ecological challenges related to resource scarcity, the ongoing loss of biodiversity and ecosystem services, or food and water security are inherently related to land systems. The transitioning of GLP towards Future Earth will therefore create further potential and promote related research globally. Summarizing, Land System Science and research on land scarcity is inherently international, with a strong German research community involved.

Understanding the Indian Ocean System

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Short presentation of the theme idea in the Future Earth context:

Over the last 50 years significant progress has been made in our ability to describe and model both the oceanic and atmospheric environments of the Indian Ocean. However, our understanding of the physical, biogeochemical, ecological, geological, coastal and atmospheric interactions of the Indian Ocean is still far from complete and in many respects rudimentary. This is caused by the fact that the Indian Ocean is substantially undersampled on both temporal and spatial scales compared to the Atlantic and Pacific Oceans. Therefore, the Indian Ocean System represents one of the last great frontiers and challenges of research.

The biogeochemical cycles and ecosystems of the Indian Ocean appear to be particularly vulnerable to anthropogenic impacts (including climate change, eutrophication and atmospheric pollution).

Overarching scientific questions are:

- What is the past, present and future role of the Indian Ocean in the Earth System?
- How do on-going climate and anthropogenic changes impact the biogeochemical cycles, marine ecosystem and atmospheric chemistry of the Indian Ocean?
- Which natural and anthropogenic processes are controlling biological production and fish stocks of the Indian Ocean?
- What are the socio-economic consequences of the on-going environmental changes (such as sea level rise etc.) for the countries bordering the Indian Ocean?
- What are the consequences of the loss of marine biodiversity and overfishing in the Indian Ocean?
- What are the potential contributions of the Indian Ocean to sustainable development for the coastal states and in the areas beyond national jurisdiction

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

In order to understand the role of the Indian Ocean System in the context of future changes in the Earth System and its associated societal impacts of the coastal states we need a joint effort of the natural and social science communities in Germany. The German communities are particularly well-prepared to tackle this question because of the existing very broad level of expertise.

Moreover, there is great interest and enthusiasm of the scientific communities in Germany to be involved in a future integrated Indian Ocean initiative especially in view of both the long-standing involment and leading roles of German scientists in past Indian Ocean projects such as IIOE, JGOFS-Arabian Sea Process Study, WOCE, INDOEX etc. .

Short description about of the internationalization potential of the suggested theme idea:

The International Indian Ocean Expedition (IIOE) carried out between 1959 and 1965 was one of the first multi-national, interdisciplinary joint programmes and marked a watershed in the pursuit of knowledge within the Indian Ocean region. A voluntary community of scientists from a broad range of disciplines has been formed to convert into reality a concept for a new Indian Ocean initiative (namely IIOE-2). The idea is timely since it coincides with the 50th anniversary of the original IIOE. It has been drawn together under the auspices of the Indian Ocean Global Ocean Observing System (IOGOOS) Regional Alliance, the Scientific Committee on Ocean Research (SCOR), the Perth Regional Programme Office (PRPO), and the Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) in support of IOC/UNESCO.

How the German research communities want to contribute to such an effort has to be discussed. Moreover, a discussion will serve to illustrate some of the key research areas that are relevant to the future international research on the grand challenges in the Indian Ocean System. Some of them have been formulated by the Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER), Oceans and Climate: Variability, predictability and change (CLIVAR) and the International Indian Ocean Expedition 2 (IIOE-2) initiatives. But others could be developed by contributions to this discussion.

Revealing Temporal and Spatial Human Dimensions of Ecosystem Developments

Hermann Jungkunst, Felix Heitkamp, Lisa Schüler, Tobias Rothmund , Engelbert Niehaus, Jörg Bofinger und Bernhard Köppen

Short presentation of the theme idea in the Future Earth context:

Perceptions of ecosystem properties without human influence across different temporal and spatial scales are limited and often not quantitative, but conceptual. Consequently, we need a broader scientific perspective because it is essential to quantitatively deduce tipping points for human pressure on ecosystems to prevent crossings of planetary boundaries. In ecological frameworks, human influence on ecosystems is commonly understood a priori as being negative. Here we challenge this "common sense" and propose research designs to improve our knowledge on (1) non-human ecosystem developments, (2) possible human up- and downgrading on these ecosystem developments in the context of driving demographic and historical factors, and (3) how humans will perceive and process such "new" and counterintuitive information, which may indicate that human influence is not always negative for ecosystems. We are convinced that there cannot be a global answer, but regional and temporal diversifications are highly expected. Consequently, we need tailored mathematical approaches beyond generalized statistics. More precisely, we are thinking of an approach similar to "Google", which always optimizes the balanced mixture of "global" interest and the tailored needs of the user to determine best individual user profiles. Therefore, most likely known general patterns of ecosystems developments will prevail for most parts, but for the individual regional scales within different ecozones relevant new perspectives are expected. These need to be transferred to education and politics to prepare the ground for region-specific decision making adding to the global approaches like the "protocols" of Montreal, Rio or Kyoto.

Only within the frame of Future Earth, would there be a chance to identify all known and unknown "pristine" ecosystems or their remnants at the global scale, which would be the basis of our approach. We propose "inaccessibility" as a suitable tool to ensure the identification of pristine ecosystems. These will most likely be limited to extremely remote areas, which are at the same time systems commonly perceived as particularly vulnerable, e.g. high mountains, arctic regions or tropical rain forests. Ideally, gradients of human influence will be studied on local sites. Here, a focus on times of epochal change in human developments, e.g. Neolithic revolution starting at very different times across the world, is proposed and has to be tightly linked to environmental and demographic developments. New insights on existing knowledge of the human dimension of ecosystem alteration will emerge with a region-specific disaggregation. We are convinced that there will be a "tipping point" until which human influence (in time) will be mainly considered positive (e.g. biodiversity increase). However, human influence can turn negative with further intensification. This tipping point will differ from the point of no return (planetary boundaries), where the negative influence is so immense that the system changes completely and cannot be restored. This development of "positive" human influence to negative will vary largely across the globe – probably the clearest example would be the comparison between temperate beech forests in Europe and tropical rain forests. For the latter, any cutting of the forest is considered detrimental for biodiversity, whereas extensive agriculture mainly led to increased biodiversity in Europe even though single species were lost. Our research project addresses laypersons' perception and understanding of "positive" human influence on the ecosystem. From a psychological perspective, theoretical and empirical reason assume that moral values (e.g., nature protection) and associated general beliefs (e.g., human influence is generally harmful to the ecosystem) have an impact on laypersons' perception of arguments regarding "positive" human influence on the ecosystem and the integration of this information into knowledge structures. We investigate the motivational impact of these processes and how values and beliefs can account for psychological resistance against such considerations. Based on our research there will be the possibility to improve scientific knowledge within Future Earth initiatives on (1) "pristine" ecosystems diversified for ecozones, (2) their individual development accompanied by human disturbances and (3) how humans can accept this new and partly counterintuitive insight as well as how it should be taught (schools, museums) and transferred into political decision making. The outcomes will eventually support the approach of defining planetary boundaries.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Wir haben darauf geachtet, dass unsere Idee von Natur- und Sozialwissenschaftlern gemeinsam entwickelt und formuliert wurde um einen rein „ökologischen" Blickwinkel um die Perspektive der Sozialwissenschaften zu erweitern. Insbesondere in den Medien werden Mensch und Natur häufig als Kontrapunkte dargestellt. Infolgedessen kann davon ausgegangen werden, dass bei wissenschaftlichen Laien der menschliche Einfluss auf Natur und Umwelt in der Regel eher als Risiko und weniger als Chance für den Erhalt von ökologischen Lebens- und Entwicklungschancen gesehen wird. Die Entwicklung dieser Voreinstellungen zu verstehen und gegebenenfalls zu modifizieren stellt eine wichtige Herausforderung für den sozialwissenschaftlichen Teil dar.

Zudem werden die „naturnahen" Ökosysteme stets als Vergleichsgrundlage jeglicher ökologischen Bewertung herangezogen. Daher müssen diese möglichst präzise und regional differenziert hergeleitet sein. Somit sind die Ökosystem Entwicklungen global zu erfassen um daraus globale Muster zu erarbeiten und regional zu spezifizieren. Der parallelisierte Werdegang von Gesellschaften und Ökosystemen ist dann beispielsweise für Forschung und Anwendung in der Paläeoökologie und Archäologie, Ökologie und Demographie oder Geoökologie und Medien-Kommunikation national sowie international von essentieller Bedeutung um eine bessere Grundlage für die Entwicklung interdisziplinärer und nachhaltiger Strategien für die Zukunft unseres Planeten zu schaffen und die Erkenntnisse in Politik und Gesellschaft zu tragen.

Short description about of the internationalization potential of the suggested theme idea:

Die Ableitung globaler Muster der parallelisierten Wertegänge von Gesellschaften und Ökosystemen geht nicht ohne Internationalisierung. Es ist quasi ein internationaler „Ansatz. Das dies nicht bereits gesehen ist, liegt daran das es nur im Rahmen eines solchen Programm wie Future Earth überhaupt zu realisieren ist.

Dynamische Ökosysteme - Forschung in „splendid isolation“ oder in ökosystemübergreifenden Ansätzen: Analyse und Management globaler Umweltveränderungen durch Integration mariner, limnischer und terrestrischer Forschung

Helmut Hillebrand, Carl-von-Ossietzky Univ. Oldenburg; Antje Boetius, Alfred Wegener Inst. Helmholtz Zentrum für Polar- und Meeresforschung, Univ. Bremen; Klement Tockner, Leibniz-Inst. Gewässerökol. IGB

Kurze Darstellung des Themas im Future Earth Kontext:

Marine, terrestrische und limnische Ökosysteme sind eng miteinander gekoppelt durch den Austausch von Organismen sowie durch Stoff- und Energieflüsse. In den vergangenen Jahren wurde die Bedeutung dieser Kopplung durch Arbeiten in verschiedenen Bereichen der Umweltwissenschaften betont. Empirische Daten belegen, dass ein erheblicher Teil der Nahrungsaufnahme in Primärkonsumenten aus benachbarten Ökosystem stammt (im Mittel sind 39% der Nahrung terrestrischer Konsumenten limnischen Ursprungs, bzw. bei limnischen Konsumenten terrestrischen Ursprungs; Bartels et al. 2012, Ecology). Dieser Transfer von Material hat starke, kaskadierende Auswirkungen auf die Funktion der beteiligten Ökosystemen, der Nahrungsnetzstruktur und der Biodiversität. Eine Vernachlässigung dieser Kopplung führt damit zu einem erheblichen Informationsverlust, der die Erkenntnis von Mechanismen der Veränderung und ihre Konsequenz für das Management von Ökosystemen nachhaltig beeinträchtigt. Am o.g. Beispiel bedeutet die Außerachtlassung der benachbarten Ökosysteme, dass für fast die Hälfte des Nahrungsnetzes die Treiber für und Konsequenzen von Veränderungen unerkannt bleiben. Auch das Verständnis von Prozessen auf der Landschaftsebene bedarf eines Ansatzes, der die verschiedenen in der Landschaft befindlichen Ökosystemtypen integriert. Zudem zeigen jüngere Synthesearbeiten, wieviel Erkenntnisgewinn aus dem Vergleich von Strukturen und Prozessen in Ökosystemen zu gewinnen ist. Ähnliche oder diametral verschiedene Auswirkungen desselben Treibers von Veränderungen auf verschiedenen Ökosysteme erlauben Rückschlüsse zu Mechanismen und Interaktionen, die sich in disziplinären Analysen nicht erschließen. Eine Reihe von Indikatoren lassen sich System übergreifend beschreiben und analysieren, wie z.B. räumliche und zeitliche Dynamiken von Diversität und Funktion, Ausdehnung und Verteilung von Habitaten, Komplexität von Nahrungsnetzen.

Dieser Erkenntnis diametral gegenüber steht eine primäre Beschränkung der aktuellen Ökosystem-Forschung, die Treiber, Ausmasse und Auswirkungen globaler Umweltveränderungen in system-internen Projekten zu bearbeiten. Selbst in breit angelegten Verbünden werden systemübergreifende Prozesse oft ganz oder teilweise ausgeblendet. Diese Trennung beruht nicht auf einer fehlenden konzeptionellen Anbindung, die durch die Entwicklung von z.B. Metaökosystemtheorie bereits formalisiert ist, sondern durch eine fehlende Einbeziehung anderer Ökosysteme in die empirische Forschung. Dies betrifft sowohl die Grundlagenforschung zum globalen Wandel wie auch die etablierten Monitoringprogramme, die Baselines der Veränderung dokumentieren sollen.
Die mangelhafte Interaktion über Ökosystemgrenzen hinweg wird neben dem mangelnden Verständnis vor allem unsere Vorhersagefähigkeit einschränken. Dadurch ergeben sich eventuell auch Managementempfehlungen, die wichtige Prozesse unberücksichtigt lassen und im schlimmsten Fall zu einer Verschlechterung des Zustandes führen kann.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Gerade in der deutschen Forschungslandshaft ist eine vergleichsweise strikte Trennung der Ökosystemforschung zu erkennen, z.B. in tropisch vs. polar, marin vs. terrestrisch. Große Forschungsverbünde der DFG (Forschergruppen und Sonderforschungsbereiche sowie das Infrastruktur-Schwerpunktprogramm Biodiversitätsexploratorien), Langzeiteinrichtungen der Helmholtz-Gemeinschaft wie Tereno, oder die marinen Langzeitobservatorien sind einseitig ausgerichtet und werden nicht in übergreifenden Programmen zusammengeführt. Forschungsinfrastrukturen werden weiterhin disziplinär aufgestellt und vernetzt, wobei eher eine konkurrierende als eine integrierende Haltung zu erkennen ist. Dagegen stehen verschiedene Europäische und Internationale Programme, die die übergreifende Dimension in Beobachtung, Modellen und Experimenten fördern (z.B. GEO, ILTER). Ein weiteres Desiderat ist die übergreifende Einbindung der Gesellschaftswissenschaften in Konzepte von Ökosystem-Management und der Sicherung natürlicher Ressourcen, die quer liegt zur aktuellen Spaltung terrestrischer und aquatischer Forschung, und neben soziologischer und ökonomischer Studien auch übergreifende historische, ethische und philosophische Fragestellungen bedarf.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Das Thema ist international stark diskutiert und hat definitive Auswirkungen auf die Struktur von Forschungsverbünden. Ein Beispiel ist das Netzwerk der Einrichtungen für ökologische Langzeitforschung (LTERs), das eine systemübergreifende Integration der Standorte betreibt.

Towards a re-conceptualization of planetary boundaries

Dieter Gerten, Holger Hoff, Wolfgang Lucht

Short presentation of the theme idea in the Future Earth context:

Global sustainability as framed in Future Earth relies strongly on the success of humanity to stay within the „safe operating space" as delineated by the „planetary boundaries" - i.e. the global environmental settings that are characteristic of the Holocene in which humanity could flourish. However, many of the nine planetary boundaries defined in the original publication (Rockström et al., 2009) are provisional or ill-defined. Therefore, their design and absolute values need to be revised and re-assessed, based on solid quantifications of the governing processes and risk of boundary transgression. Such a conceptual re-evaluation and re-assessment should be complemented by equally comprehensive assessments of how fast humanity is approaching the boundaries, and what the drivers of this development are. Analogous analyses should also be performed for individual regions or countries (such as Europe and Germany), in order to see how close they are to their very environmental boundaries and what their contribution to the approachment of planetary boundaries is.

An inspection of how the planetary boundary for freshwater consumption (4.000 km3/yr) has been calculated reveals that it is based on some global assumptions, while the regional patterns of availabilities and limitations were largely ignored. However, a more robust global freshwater boundary can only be determined by a bottom-up approach that accounts for local conditions and thresholds - only their cumulative effect can be aggregated to a global number. A starting point for this is to quantitatively constrain the global freshwater resource by local environmental flow requirements, which should not be tapped by humans (through agricultural, industrial and domestic water withdrawals) if ecosystems are to be preserved in a good status (i.e. if they are tapped, breakdown of ecosystems and transgression of tipping points cannot be precluded). Furthermore, the freshwater boundary needs to be conceptualized together with the planetary boundary for land use (and others), as they are obviously linked. For example, changes in land use do provide feedbacks to water availability, and strategies to stay within the freshwater boundary may have adverse implications for the land use boundary. Also, planetary boundaries are not necessarily static, and their definition depends on the values that humans assign to their environments, e.g. in what status river ecosystems should be kept. Hence, their definition requires to be ethically informed as well (see proposal by Ziegler & Groenfeldt) .

These considerations make the re-definition an interdisciplinary task that needs to involve both the earth system sciences and the humanities. Further economic and social issues are the costs and benefits of transgression vs. costs and benefits of staying within the safe operating space; and implications of boundaries from an equity perspective (e.g. equal per-capita allocations). Furthermore, when computing boundaries for regions or countries, their external footprints, hence the externalization of boundary transgression is also of interest.

Overall, if firmly conceptualized and quantified, and ecologically and ethically well informed, the planetary boundaries concept can help to identify possible collisions of global (and sub-global) sustainability goals, among them water security, food security, climate mitigation and the UN's Sustainable Development Goals.

REFERENCE FOR THE ABSTRACT: Gerten, D., Hoff, H., Rockström, J., Jägermeyr, J., Kummu, M., Pastor, A. Towards a revised planetary boundary for consumptive freshwater use: role of environmental flow requirements. Current Opinion in Environmental Sustainability (COSUST) 5, 551–558.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Various disciplines and institutes in Germany are believed to have a genuine interest in re-designing and re-assessing planetary and local (or national) environmental boundaries and to identify opportunities of how societies can stay below them. This requires a multi-scale and interdisciplinary cooperation, not only among earth system sciences but also among different strands of the humanities (ethics, cultural and behavioral sciences, etc.). Specifically in Future Earth and in Germany, cooperation is envisaged / believed to be fruitful with Ziegler & Groenfeldt (ethics), Bogardi & Badhuri (planetary freshwater boundary), Pahl-Wostl et al. (sustainable water future), and Tockner et al. (aquatic ecosystems) - see their abstracts.

Short description about of the internationalization potential of the suggested theme idea:

Cooperation should be (and is already ongoing) with the originators of the planetary boundaries concept (Rockström et al.), and as this topic is about global/ planetary limits and development opportunities, a number of i(excellent) nternational partners could join a respective research network (in the context of Future Earth). Work on this topic is ongoing at PIK (OPEN project, http://www.pik-potsdam.de/research/earth-system-analysis/projects/flagships/open), in cooperation with the Stockholm Resilience Center, Wageningen University, the University of Frankfurt, The Pacific Institute, IIASA, the Water & Culture Institute, Aalto University, The Global Water System Project (GWSP), UFZ Leipzig, and others.

Entangled polyrationality: The joint venture of Environmental Justice and Climate Change

Dr. Götz Kaufmann

Short presentation of the theme idea in the Future Earth context:

The impacts of climate change (CC) on human populations at a global scale are both diverse and complex. At the regional level, the perception of climate change impacts is strongly influenced by underlying social realities. In order to develop a model for CC adaptation policies, it is essential to understand the relative importance of broad social conditions (e.g. political system, cultural peculiarities, national history, etc.) and localized social deprivations (income, infrastructure, public services, etc.) on the perception of climate change impacts at the community level. Since existing conceptions and models have failed to mitigate the problem and at least reduce its impacts in the last twenty to fourty years (depending by the viewpoint), the establishment of a controversal concept is required to sharpen the debate and reveal the polyrationality of CC: Environmental Justice (EJ). In fact, EJ has been developed in the late 1970s and established until the early 1990s, but hasn't lost its critical characteristic. Basically defined as the unequal distribution of environmental burdens and environmental quality, the concept has brought the debate on generation justice beyond intrageneration considerations. The critique on the world's given assumptions on development, sustainability, existing environmental institutions (governmental and NGOs) has been centered in various local settings. Alone, most of the addressed problems have been reduced to particular discrimination accusations instead of globalizing the concept to see through the polyrationality of CC understanding. Moral judgement and calls for a more just world have replaced a more system theoretically founded understanding of the constructed social (Luhmann). The EJ concept has the potential to push the CC debate on a new level. The question is no only the moral normative question, who is suffering and who is benefitting from the existing situation, but why? It is part of the „sociological thinking", which Irigaray critisized from her gender driven viewpoint, that the frame, in which CC takes place has been less addressed in international research than it would be necessary. This frame assumes that the solution we are looking for can be found in the world's current design.

The scientific community has already accepted that solutions can only be found by combining the strengths of both nature and social sciences. Despite concepts of inter- and transdisciplinarity, claims for transformation and transformative research, and demands from public, economic and civil society sector, most projects have used the catchy concept in its broadest meaning. In fact, true trans- and interdisciplinary, transformative research on transformation is rare even it is enduringly asked.
The mentioned rarity is due to a particular research focus within a sociological thinking which actually is a general scientific thinking in all disciplines. It ignores the autopoeisis of social systems (Luhmann, Merten) and assumes a general view where effectively is polyrationality.
A final notice to the scientific relevance of the topic for the German Future Earth Summit: Despite the aspiration to include and highlight social scientific contribution to the issue, the outlined research agenda of the three research fields still favores what Dryzek calls the „technical" approach. Even the literature selection in the 2012 report, to which this call refers, proves this critique true: Most relevant discourses from and in environmental social sciences aren't even mentioned (i.e. Vlassopoulos, Groß, Grundmann, Elvers, Mignolo, Martinez-Alier, Dryzek, Eckersley among others, and not even to speak about theoretical considerations [Luhmann, Irirgaray, Latour, Marx, Grosfoguel etc.]).
In order to assist the committee in its aim to (at least try) to put social science on equal footing compared to the so called ‚hard sciences', the presented proposal combines two concepts that originated and developed mainly in nature science (CC) and environmental social sciences (EJ). Some loose projects are already working in this proposed pattern, which are named in the following to strengthen the importance and relevance of the proposed research priority. All but one haven't established a clear distinction of the concepts, nor do they necessarily focus pari-passu on EJ and CC.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

There are some reason to establish such research priority on EJ and CC. First and foremost, EJ isn't an established research paradigm even if other countries (USA, Canada, Brazil, Australia, UK etc.) make already heavily use of it. This ranges from establishing a separated law identity (Schutzgut) in the German environmental regime (Foucault) to a research focus on causing clusters of inequal distribution in terms of procedural, distributive and chance justice. CC is discussed in Germany as a question of ‚convincing undeniable evidence' (see research done by PIK and IASS) instead of taking polyrationality as the starting point (i.e. the Kuznet curve is not for everyone a convincing evidence for man made CC).
As main example here, the joint research project CC-VISAGES (Climate Change - Vulnerability Inferred through Social Analysis, Geography, and Environmental Systems; cf. description incl. poster here: http://preview.tinyurl.com/nc43hn2), which is financed by the Stiftung Deutsch-Amerikanische Wissenschaftsbeziehungen (2013-2015), will be used as reference since it has been built in the spirit of the proposal by the proponent. Further examples are the spread and non-connected research initiatives from geoinformatics HU Berlin (https://www.geographie.hu-berlin.de/Members/lakes_tobia/rp) and the interdisciplinary junior research group (planning, public health, political science, sociology among others) at TU Dortmund (http://www.jufo-salus.de/cms/en/Welcome/index.html).
These examples clearly shows inasmuch German research community can benefit from a focus that structures and combines separated efforts in the field Additionally, existing non-academic projects such as the ‚generation manifesto' from civil society, the UBA's strategies for more EJ, and the research intent with goal of better political advice by FEST Heidelberg and FFU Berlin may complete the exemplified field of positive impacts when such researches are bundled. Through this, the ideal of an interdisciplinary and transdisciplinary transformative CC transformation research can be approached.

Short description about of the internationalization potential of the suggested theme idea:

The potential for internationalization is manyfold and rich. As positive example, the named main example of CC-VISAGES will be used to illustrate the general benefit for the world's scientific community, which has already been announced by the World Council of Churches' >Call for Climate Justice<.
Since the CC-VISAGE's planning phase in 2012, a network of internation social and nature scientific climatologists in Brazil (UFPA/NAEA), Australia (UniMelb, ANU), Canada (McGill, UNQAM), and Germany (FU/FFU, KIT/ITAS) has already been established. It is planned to encourage further research during and after the project is running. Other climate change projects with related or similar questions / topics shall be invited to / included in the existing international network. Side-effect of CC-VISAGES is to build a growing network climatologists from social and nature science that mutually benefit from the findings of one another. This is supported by in-time provision of the first hand data that can be used for retesting, extension or modification. The model here is Inglehart's World Value Survey that can be used by every student for further analysis. CC-VISAGES will make all data available on www.cc-visages.com, which will also be promoted with help of the CC-VISAGES Facebook site (upcoming). Other approaches may come by creating a roof for research on CC and EJ through the proposed research focus. Bundled international funding focussing on research with interest in international transformative transformation research to the topic, will help to create a growing data base of perspectives, which - regardless of whether you agree with the particular viewpoint or not - frames the research fiel that represents the ‚dynamic planet'.

Future Land Development for Sustainability - regional solutions for global development

Prof. Dr. Gerhard Gerold (Universität Göttingen); Prof. Dr. Patrick Hostert (Humboldt Universität Berlin), Prof. Dr. Hermann Jungkunst (Universität Koblenz-Landau); Dr. Rüdiger Schaldach (USF-Universität Kassel) und Dr. Regine Schönenberg (FU Berlin)

Kurze Darstellung des Themas im Future Earth Kontext:

Vor dem Hintergrund begrenzter Ressourcen im Erdsystem (s. Rockström et al. 2009: A safe operating space for humanity) bei zugleich steigender und weiter prosperierender Weltbevölkerung, stehen der globale Klimawandel und der Übergang zu einer nachhaltigen Land- und Ressourcennutzung im Fokus von Forschung und Gesellschaftsentwicklung. Ohne Berücksichtigung der Entwicklung terrestrischer Ökosysteme und der zukünftigen Landnutzung zur Sicherung von Ernährung und Bioenergie, wird es in vielen Weltregionen zu dramatischen Biodiversitätsverlusten, einem spürbaren Rückgang von Ökosystemdienstleistungen, zunehmender Konkurrenz um Land, Wasser und weitere Naturressourcen und in Folge dessen zu sozio-politischer Instabilität kommen. Zwar wurde und wird der globale Umweltwandel mit komplexen Modellen vielfach untersucht, die prognostizierten Umweltauswirkungen und globale Prozesskenntnis bedürfen jedoch eines verstärkt regional abgesicherten Verständnisses, was sowohl die Auswirkungen globaler Prozesse in kritischen Regionen der Erde, wie auch die Auswirkungen des regionalen Umweltwandels auf großräumige und globale Umweltsysteme angeht (z.B. Wasserhaushalt, C-Kreislaufvgl. Lovejoy 2007: Bistability of Amazonian Forest?, Richard Blaustein, Amazon Dieback and the 21st Century, 2011). Dabei besitzt gerade auf der regionalen Skala das sozio-ökonomische und sozio-kulturelle System mit seinen Akteuren für die Prognose zukünftiger Entwicklungen, insbesondere auch der Landnutzungsentwicklung, eine besondere Bedeutung. Das Verständnis der Wechselwirkungen zwischen Land- und Wasserressourcen einerseits und den Dynamiken des sozio-ökonomischen Wandels andererseits, ist für die Frage der nachhaltigen Landnutzung von großer Bedeutung. Aufgrund desglobalen Stellenwerts sowie bestehender Forschungsexpertise ist an eine Fokussierung auf „South American Deforestation hot spots“ gedacht.

Die für Verbundforschung geeignete Themenstellung (z.B. laufendes BMBF-Forschungsprogramm FONA) soll mit einem systemanalytischen (Regionalanalyse; Modellierung) und interdisziplinären Ansatz (Umwelt- und Gesellschaftswissenschaften) bearbeitet werden, wobei regionale Stakeholder und Akteure schon in die Entwicklung der Forschungsfragestellungen einzubeziehen sind. Transdisziplinarität im Sinne von interdisziplinärer Forschung in enger Abstimmung mit anwendungsorientierten, institutionellen und landnutzenden Akteuren in der Region, garantiert Bedarfsorientierung und damit Forschungsergebnisse, die im Einklang mit gesellschaftlichen und wissenschaftlichen Prozessen im Partnerland stehen. Letzteres ebnet den Weg zur Anwendung der Ergebnisse im Rahmen nachhaltiger Partnerschaften vor Ort – einem zentralen Anliegen von Future Earth.

Fragen der nachhaltigen Landentwicklung umfassen dabei einen ökonomischen, geoökologischen und sozio-politischen Ansatz mit:
a) Landressource – Nutzungspotential: Flächenkonkurrenz und agrarökonomische Entwicklung (z.B. Fragen der Landdegradation, Konkurrenz von Bioenergie, Nahrungsmittelproduktion, Urbanisierung, Naturschutz)
b) Land als Umweltsystem: Wasser- und Nährstoffkreisläufe als geowissenschaftliche Grundlage mit Simulation ihrer Änderungen durch „climate change“ und „Land use change“ insbesondere in der Einzugsgebietsskala mit „Integrated Water Resource Management - IWRM“
c) Land als sozio-ökologisches System: Sozio-ökonomische Dynamik, sozial-politische Entwicklungsprozesse im Rahmen globaler und regionaler „trade-off“-Dynamiken (Präferenzen für Nahrungsmittel, Landschaftsdiversität, agrarökonomische Entwicklung, Welthandel); Land/Naturressourcen und deren „Governance“ (sozio-politische Verfügungsgewalten und –zugang) und die Resilienz gesellschaftlicher Organisation als Schlüsselressourcen für die Nutzung von Energie, Biomasse, Wasser und Ökosystemleistungen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

„Land Change Science" basiert auf einem transdisziplinären Ansatz, das heißt sowohl der Einbeziehung unterschiedlicher Fachdisziplinender Naturwissenschaften und Sozialwissenschaften mit den Bereichen Ökonomie, Umwelt, Sozio-Politik, Normen und Werte, Governance und Konflikte, als auch die Kooperation mit nicht-wissenschaftlichen Akteuren vor Ort. Bereits laufende sowie zur Fortsetzung geplante Forschungsschwerpunkte in Deutschland wie auch in Südamerika (insbes. Brasilien) zeigen das hohe integrative Potential zur inter- und transdisziplinären Forschung in diesem Themenbereich, wie „Forschung zur Nachhaltigen Entwicklung - BMBF", „Wissenschaft für Nachhaltige Entwicklung - VW-Stiftung", DFG-FAPESP „Land-use Change and Land-use Management under Conditions of Global Change"; ABC-Programm Brasilien.

Forschungszentren wie ZALF, UFZ, PIK, MPI-M sowie universitäre Zentren (z.B. LAI-Berlin, IRI THESys Berlin, USF-Kassel), mit denen bereits Verbundforschung besteht, besitzen eine entsprechende Expertise für den o.a. Themenkomplex.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Das Forschungsprogramm greift Ziele der UN (MDG´s, future Sustainable development Goals) und der bisher existierenden, internationalen Forschungsprogramme und ihrer core projects auf (IGBP, IHDP und hier insbesondere das bei beiden affiliierte Global Land Project) und setzt diese den Zielen von Future Earth entsprechend mit stärkerer Einbindung der regionalen Stakeholder neu um.

Die Verbundforschungsthematik mit den Ökosystemservicebereichen „Landressource und Wasser" ist über die Einzugsgebietsskala mit „Integrated Water Resouce Management" verknüpft mit „International Decade for Action Water for Life (UNESCO)-Programm).
Beispielsweise würde auf brasilianischer Seite mit dem „Regionalfocus Amazonien" eine Verknüpfung mit den international agierenden führenden brasilianischen Forschungseinrichtungen wie INPE, INPA, ANA und Embrapa weiter ausgebaut.

Transition in (tropical) coastal zones – The challenge of global changes to coastal social and ecological systems on regional and local scales

Werner Ekau, Marion Glaser, Achim Schlüter, Hildegard Westphal

Short presentation of the theme idea in the Future Earth context:

Global coasts are the interface between land and sea, a major recipient of human migration and a focus of multiple and competing natural resource uses.
Coastal regions are also focal areas for the impact of global changes and pose central challenges to global sustainability work. As climate change, pollution and resource use impact coastal ecosystems and populations on regional and local scales, knowledge-based assessment of the risks, in particular with respect to the occurrence of extremes, are needed for management, planning, adaptation or mitigation, and policy development.
The implications of global change for coastal ecosystems and communities are interrelated, and difficult to forecast. The challenges in understanding the processes that affect the direction, frequency, and amplitude of coastal system changes and their social and economic consequences require an extensive and holistic effort. An interdisciplinary effort to investigate the driving forces of coastal system change such as climate (temperature, precipitation) and coastal water characteristics (temperature, oxygen situation, current speed, carbon and nutrient cycles), their impact on terrestrial and marine production systems, the driving forces of coastal change emanating from social systems, and the assessment of options for sustainability-enhancing coastal governance and management need to be part of a transdisciplinary linking of coastal knowledge types. Activities of human societies such as land-, water- and aquatic resource use will trigger highly non-linear processes in the ecosystems and their feedback with coastal ecosystem dynamics is crucial for understanding the overall system and for developing and implementing sustainable coastal governance and management in the future.
Most coastal areas are in transition – both socially and ecologically – and future projections of change indicate exacerbated vulnerability in both social and ecological systems to multiple drivers such as climate variability and changes in land use. Understanding how this transition manifests through time and across a heterogeneous setting requires the identification and quantification of key processes in these social-ecological systems and how they interact.
Especially along tropical coasts many local communities strongly depend on their natural environment to meet basic livelihood needs. This includes freshwater for subsistence, agriculture and household use, and various wild plants and animal products from fresh, brackish and coastal waters that are used for medicinal, food and cultural purposes. This strong dependence on ecosystem services makes such communities vulnerable to environmental variability and to extreme events, provoked by local, regional, and global climate and environmental changes.

Objectives:
- Identify and quantify key physical drivers for dynamic processes predominating in coastal systems
- Identify key social drivers of coastal change, the main stakeholders driving these changes and those with key leverage positions in coastal governance and management
- Understand variability and interrelationships in key components of coastal systems
- Identify tipping points and thresholds in changing systems
- Evaluate and quantify responses and feedback mechanisms between bio-geophysical and social elements of coastal systems
- Forecast future scenarios under a range of realistically possible conditions

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The research of the Leibniz Center for Tropical Marine Ecology (ZMT) pursues the aim to contribute the scientific basis for sustainable development in tropical coastal zones. The ZMT leads the field in Germany in terms of integrating natural and social science research on coastal and marine sustainability issues in tropical regions. With its recently implemented Executive Support Unit for the Dialogue with Stakeholders, ZMT aims to strengthen the implementation of its research on coastal social-ecological dynamics. Paths have to be found which support the application of transdisciplinary knowledge generated for the governance and management of tropical coastal zones to successfully achieve ecological, economic and social sustainability objectives.
Significant German research capacities on coastal zones in polar and temperate regions of the globe are also present in the Alfred Wegener Institute, (Bremerhaven), the Institute for Baltic Research in Warnemünde, and in a range of other German institutions, including the 10 institutes represented in the Nordwest-Verbund Meeresforschung (NWVM) and the Universities of Hamburg, Kiel, Oldenburg and and Rostock.

Short description about of the internationalization potential of the suggested theme idea:

Several large international projects and networks are engaged in long-term research on global coasts. Over the past 20 years, the Land-Ocean Interactions in the Coastal Zone (LOICZ) program has developed from bio-geo-chemically focused natural science projects on coastal zones to an interdisciplinary endeavor in which natural and social sciences collaborate to assess co-evolving social-ecological change in coastal zones across the globe and the program is now accepting the challenges of co-design of research agendas and co-production of coastal knowledge. Coasts are also an important element in projects such as IMBER, or in marine-focused research and implementation such as in the fishery-focused Large Marine Ecosystem- and Regional Seas programs. The German capacities on coastal research should continue to constitute a strong voice in these circles and contribute to transdisciplinary sustainability research and action across the globe.

Influence of rapid socio - economic and environmental changes in BRICS countries for future of our dynamic planet

Sergey Venevsky, Center for Earth System Studies, Tsinghua University, Beijing, China

Short presentation of the theme idea in the Future Earth context:

Economic map of the world is changing rapidly these days. Old superpowers like US, Japan and leading European countries are now giving their first places for new countries with rapid economic transformations. So named BRICS (Brazil, Russia, India, China and South Africa) countries are first on the list of emerging economies. These countries after serious political transitions came to liberalization of their economies and enjoy growth of prosperity and economic boom. However, the prosperity did not come without in-country high environmental price. Rapid urbanization is changing now traditional land use and land cover patterns, High inner consumption and growing manufacturing and intensive agriculture in BRICS countries caused severe atmospheric and water pollution and enormous emission of greenhouse gases. Environment of large regions in BRICS countries is frequently over-exploited for purpose of developing socio-economic infrastructure in large cities. Transnational companies located in BRICS countries are sprawling their negative environmental footprint to other continents (like Africa). Meanwhile, BRICS countries are areas of unique and high biodiversity, forests in Brazil and Russia are playing major role in offsetting global warming. Thus a healthy state of their environment is a global problem. How growth of economic and social infrastructure in BRICS countries may influence global state of our dynamic planet? Is there a way to develop these large remote regions with keeping balance between protection of environment and prosperity for future generations?

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

This topic is an intersection between natural and social sciences. Germany has a large scientific community (to be mentioned PIK, Humbodlt University, Jena BGH Max Plank Institute, Jena University etc) and non-scientific (German Organization of Development etc) already working in mentioned directions, but relationships with BRICS institutions in the frame of suggested topic should be strengthen.

Short description about of the internationalization potential of the suggested theme idea:

Author has a close scientific relationship with institutions in China (Tsinghua University, Institute of Atmospheric Physics CAS), in Russia (Space Research Institute RAS), in Brazil (INPRO). Collaborations in India and South Africa should be conceived.

Frontiers in Sustainability Research: Socio-Ecological Novelty (SEN)

Anke Jentsch, Bernard Slippers, Silja Klepp, Vicky Temperton 1

Short presentation of the theme idea in the Future Earth context:

Sustainability is increasingly attracting attention in contexts such as climate change, biodiversity conservation, ecosystem services, consumption, inter-generation fairness, justice across hemispheres, and more. However, the view of sustainability that focuses on indefinite availability of resources to preserve historical societal needs (preserving the past) is outdated. There is a growing realization that we are confronted with novel, unpredictable futures both ecologically and socially, and that these are interconnected [1, 2, 3]. Members of the German scientific community currently stimulate the global debate on Ecological Novelty. The goal is to take the topic of socio-ecological novelty beyond current state fo the art knwoledge, across hemispheres and across disciplines from science and humanities.

Novel ecosystems might have novel species compositions, novel disturbance regimes or novel rules of interaction that have not occurred previously within a given biome [4]. Novel ecosystems create novel processes in societies, provide novel opportunities and require novel management structures [5]. The rates of change and uncertainty this creates can destabilize ecological and social structures at various levels. These novel systems have novel values, potentials and impacts on societies. Yet, novel ecosystems can also induce social instability, such as the collapse of governance or a breakdown of intergenerational care.
We need a new perspective that overcomes the prevalent division of Nature and Society that impacts our thinking, our research and our policies. The broad occurrence of socio-ecological novelties, as well as the increasingly rapid and unpredictable changes that it will bring, challenges social structures and requires a different frame of thinking to respond effectively as a society.

The intention of this topic suggestion is to explore the „Socio-Ecological Novelty“ (SEN) debate from two very different perspectives from the Northern Hemisphere and the Southern Hemisphere (, in order to stimulate emerging fields of research and to inform the urgent science-policy engagement on this topic.
The topic could be structured under four themes, namely:
- The value-debate in socio-ecological novelty
- Emerging issues in research across disciplines
- Opportunities and challenges to application of knowledge
- Layers of engagement, from global justice to local relevance, and the need and challenges of interdisciplinary research.

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Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Sustainability is increasingly attracting attention in contexts such as climate change, biodiversity conservation, ecosystem services, consumption, inter-generation fairness, justice across hemispheres, and more. However, the view of sustainability that focuses on indefinite availability of resources to preserve historical societal needs (preserving the past) is outdated. There is a growing realization that we are confronted with novel, unpredictable futures both ecologically and socially, and that these are interconnected [1, 2, 3]. Members of the German scientific community currently stimulate the global debate on Ecological Novelty. The goal is to take the topic of socio-ecological novelty beyond current state fo the art knwoledge, across hemispheres and across disciplines from science and humanities.

Short description about of the internationalization potential of the suggested theme idea:

see above: The goal is to take the topic of socio-ecological novelty beyond current state fo the art knwoledge, across hemispheres and across disciplines from science and humanities.

Entwicklung von automatisierten Monitoringstationen für Artenvielfalt

W. Wägele, S. Pietsch

Kurze Darstellung des Themas im Future Earth Kontext:

Die dramatischsten Veränderungen des Systems Erde sind aktuell der Klimawandel und der Verlust an Biodiversität, beides durch Wachstum von Industrie und menschlicher Bevölkerung verursacht. In geologischen Zeiträumen betrachtet ist der Klimawandel reversibel, es gehen dem Planeten dabei keine abiotischen Ressourcen verloren. Biodiversitätsverluste sind dagegen irreversibel, wenn Arten gänzlich aussterben.

Auffällige Prozesse, die den Verlust verursachen, sind gut verstanden (z.B. Abholzung von Wäldern), die dadurch gefährdeten Arten bleiben aber überwiegend unbekannt. Die Aussterberate läßt sich aktuell nicht beziffern und belegen. Um Schwellenwerte für Populationsgrößen zu benennen, die nicht unterschritten werden dürfen, sind Kenntnisse der Populationsdynamik und -genetik erforderlich, die nicht verfügbar sind. Um Habitate zu identifizieren, die im Vergleich mit anderen besonders erhaltenswert sind, sind Inventare notwendig, die nicht existieren. Veränderungen der Biodiversität, die vom Klimawandel verursacht sind, lassen sich nur beschreiben, wenn historische Ausgangsdaten (baseline data) zum Vergleich vorliegen. Diese fehlen für fast alle Regionen der Erde, einschließlich der schon lange bestehenden Nationalparks der Industrieländer.

Die wichtigste Ursache für den Datenmangel ist der Aufwand, der für die Bestimmung von Arten geleistet werden muss („taxonomic impediment"). Das zweite Hindernis ist die aufwändige manuelle Probennahme. Für eine Inventarisierung von Fauna und Flora werden Dutzende von Spezialisten (Taxonomen) gebraucht, und die Probenbearbeitet erfordert viel Zeit. Regelmäßige Wiederholungen für Monitoring sind nicht durchführbar.

Neue Technologien erlauben es jedoch, diese Hindernisse partiell zu überwinden. Durch Kombination von angepassten Verfahren der Bioakustik, des DNA-Barcoding, und der Analyse von Bildern, die aus Fotofallen stammen, lässt sich eine Automatisierung der Beobachtung eines größeren Anteils der Artenvielfalt erreichen, analog zur Datenaufnahme einer meteorologischen Wetterstation. Durch Ergänzung mit Fernerkundungsdaten und Extrapolationen mit Nischenmodellierung lassen sich Szenarien darstellen, analog zu Klimamodellen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Langzeitmonitoring ist relevant für alle, die mit Landschaftsplanung, Bewertung von Eingriffen in der Landschaft, Berichterstattung im Umweltbereich, Agrobiodiveristät, Natur- und Artenschutz, Regewaldschutz, Gewässergüte, nachhaltige Nutzung von Biodiversität, oder in der ökologischen Grundlagenforschung zu tun haben. Die Daten werden auch für Politikberatung benötigt. Indirekt relevant sind die Ergebnisse auch für die Förderung von Naturtourismus und Erholungsgebiete. Erkenntnismangel führt zu Aussterben von Arten, Verlust von Ökosystem-Dienstleistungen und letztlich zum irreversiblen Verlust von Ressourcen, die für die Lebensqualität künftiger Generationen wichtig sind.

Die Entwicklung einer „Wetterstation für Biodiversität" und ihr Einsatz in Pilotstudien wird aktuell unterstützt von der Arbeitsgruppe „Langzeitmonitoring" der Allianz für Forschung, vom Leibniz Verbund Biodiversität und von der DNFS (Deutsche Naturkundliche Sammlungen), von Gutachtern und Koordinatoren der Biodiversitäts-Exploratorien der DFG. Soweit sie bereits informiert sind, unterstützen auch die Verwaltungen der Nationalparks und regionale Biologische Stationen das Projekt.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Komponenten, die für ein Langzeitmonitoring gebraucht werden, sind bereits internationalisiert. Dazu gehören Datenbanken zum Vorkommen von Arten, für artspezifische genetische Marker, Bilddatenbanken, international koordinierte Beobachtungsflächen (z.B. BON: Biodiversity Observation Network). Für die globale Politikberatung wurde IPBES gegründet (Interngovernmental Platform on Biodiversity and Ecosystem Services), mit Sekretariat in Bonn. Sollte in Pilotstudien das Konzept „Wetterstation für Biodiversität" erfolgreich sein, wird es weltweit eingesetzt werden können.

Earth Contraction and Global Earth Sustainability

Ibrahim M. Metwally, Prof. in Civil Eng. Department, Faculty of Eng., Zagazig University

Short presentation of the theme idea in the Future Earth context:

Earth from the global point of view is just a body that has different parts. Everything taking place in or on earth is inter-related and affecting Earth Dynamic and Kinematic Systems. Earth is facing a serious irreversible, uncontrollable change that is Earth contraction. Earth contraction is the major contributors for global earth changes. As earth contracts two major changes, among others, would take place the first is change of the distance of earth to sun, earth orbit around the sun and the inclination angel of sun rays on earth, second is changes the water surface areas on earth and consequently the sea level changes . Earth contraction is also affecting the variation in crust shape and consequently, earthquakes, tsunami, and hurricanes occurrences. Within the framework of continuum mechanics, the presented research introduces the effect of volcanism activities on earth size changes that can be driven mathematically and proof earth contraction. A hundred million cubic kilometers of volcano outcomes would decrease the radius of earth by less than 2 km approximately. As the volcanoes outcomes increase gradually, contraction accumulates gradually over time to be significant. That would result in very slowly but continuous changes in the position of the earth relative to the sun that has the most dominating influence on all the changes on earth. The fare end of earth contraction is returning earth radius to its original state before earth expansion. Then, as this research forecasts, end of man life occurs. No doubt that any significant change in Earth's radius will alter the understanding of earth dynamic and all physical processes. This theory provides a deep understanding for past, present and future changes and interactions in global climate, watersheds, oceans, ice cover, and the natural drivers of environmental changes, which is needed as a basic for global sustainability. It also, provides an early warning system for abrupt, uncontrollable and irreversible change that would be of use to decision makers, resource managers and business. The presented theory does not violate neither physics nor thermodynamics laws as the other two theories, greenhouse and ozone hole theories, did. This theory also answers all unanswered questions the other theories fall to answer, such as if sun is shrinking due to losing millions of tons of its mass in every second why earth is not going far from sun.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany like all other countries in earth experienced global worming. The impact of global worming is different in different regions of Germany. However, in Germany during the last century the average temperature has risen by 0.9°C. It is wrongly believed that social, economic and technological developments are disrupting the climate and the environment on a global scale and that Germany is both affected by and partly responsible for these problems, but these are not quite correct. No one is responsible for climate and most of environmental global changes. Earth Contraction in general is a must to keep the balance of the solar system. Therefore, man-kind must get along with some of these changes and face and solve others. Earth Contraction theory will answer fundamental questions about how and why the global environment is changing, what are likely future changes, what are risks and implications for human development and the diversity of life on Earth, and what the opportunities are to reduce risks and vulnerabilities, enhance resilience and innovation, and implement transformations to prosperous and equitable futures. German communities as a part of the world has great potential to be part of main strategy of

1. predicting the irreversible uncontrollable changes,
2. facing and solving the controllable changes.
3. predicting consequences, analyzing them and providing practical, targeted options for adaptation.

It is apparent that research is becoming a increasingly important factor in decision-making processes, as it allows solutions and answers to be found that are not only valid now, but in the future too. In Germany current vulnerability is high in the water sector, due to increasing flood risk and high potential for damage. In addition, the risk of droughts is increasing, particularly in Eastern Germany. Currently, few adequate adaptation measures to this stress are locally available. This results in locally high current vulnerability. However, for the entire country there appears to be only moderate current vulnerability to droughts in Germany. However, getting good results is based on correct understanding of the cause, which is provided by the presented theory, earth contraction theory.

Short description about of the internationalization potential of the suggested theme idea:

Earth from the global point of view is just a body that has different parts. Everything taking place in or on earth is inter-related and affecting Earth Dynamic and Kinematic Systems. Therefore, mankind must think globally and act locally. The proposed research will provide the knowledge needed to understand observed and projected trends in the Dynamic and kinematic Earth systems, including all potentially irreversible natural changes, variations and extremes, and its interactions globally. It will also, contribute to knowledge and understanding past, present and future changes and interactions in global climate, watersheds, oceans, ice cover, and the natural drivers of environmental changes, and how and why the planet is changing and forecasting likely futures. The proposed research integrates different global aspects that takes place on earth as a planet and not as individual aspect in order to be able to predict future extremes to take place, such as earthquakes, tsunami, hurricanes, global worming, and changing sea level. The introduced research focus on key issues such as climate change, and ocean variability not only in its surface water level (sea level) but also, its surface areas. No doubt, that there is a critical need for basic science to understand the mechanisms of different earth dynamic and kinematic components globally in order to move towards prediction and informed management. Accurately understanding the key factors and the inter-related mechanisms and modelling our dynamic and kinematic planet relies on the fundamental Earth science undertaken by global environmental change. This research also addresses more fundamental and long-term variation that are needed for global sustainability and development of Early Warning Systems Against Natural Hazards. It is important to emphasize that Future Earth focuses on the intersection of different aspects with global and regional environmental change and the ways in which environmental research can help address development goals. Today's global emissions , which is a formidable challenge, need to be lowered from 7 Gt carbon per year to 2 Gt per year, is not required any more. Greenhouse is not the controlling factor, it might be a minor one. What the world needs now is estimating the volume of volcanos outcomes. Of course no way to reduce it or control earth contraction, but facing this fact and predicting its consequences to be able to reduce its negative impact and get the most benefit of the positive ones on human life.

A need for large-scale experiments to forecast consequences of global change on biodiversity, ecosystems and their services to society

Mark Gessner

Short presentation of the theme idea in the Future Earth context:

Assessments of future impacts of global environmental change on ecosystems and biodiversity are essentially based on (i) patterns detected in observational studies, (ii) outputs of numerical models, and (iii) results derived from small-scale experiments. These approaches can yield valuable insights but, like all scientific methods, also suffer from limitations. Small-scale experiments in laboratory settings may test for specific mechanisms that have been hypothesized, but their outcomes can be misleading if important system components are insufficiently represented in the experimental set-up. This is especially true when indirect effects arise from species interactions. Similar criticism applies to theoretical models. Analyses of observational data can be suggestive but they fall short of pinpointing the importance of a given factor, or of the interactions among multiple factors. Experiments conducted at the ecosystem or landscape scale are often considered the gold standard. However, logistic, financial and legal constraints typically prevent the use of proposer experimental designs. In particular, replication becomes challenging as the size of the manipulated ecosystems increases. Large experimental facilities that capture most of the complexity of natural ecosystems could be a powerful missing link in the methodological toolbox to examine and forecast ecological impacts of global change. Because even large experimental set-ups are necessarily local (as opposed to regional, continental or global), coordination of experiments carried out across multiple sites are particularly promising to generalize results across broad spatial scales. Several initiatives in a variety of ecosystems, ranging from marine to freshwater to terrestrial, are underway to implement the large-scale experimental approach for assessing consequences of global change on ecosystems and biodiversity. I propose (i) compiling and summarizing information on such experimental facilities in Germany that have potential to inform about global change effects; (ii) exploring the potential for coordinated large-scale experiments; (iii) bringing experimentalists, other empirical scientists and modelers together to discuss the value and limitations of large-scale experimental approaches, and (iii) identify interfaces for the exchange of information among these groups of scientists.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

I expect the topic to be of primary interest to ecologists, biogeochemists, geophysicists, and other environmental scientists. Moreover, because collective human behaviour may have much greater consequences on ecosystems and biodiversity than climate and other physical, geochemical and biological changes of ecosystems, social scientists can both usefully inform the design of experiments and benefit from the experimental results irrespective of whether experimental designs consider socioeconomic scenarios.

Short description about of the internationalization potential of the suggested theme idea:

Beyond the national German level, the envisaged exchange of ideas may serve as a nucleus for initiatives at the European (e.g. Horizon 2020, Netlake) and/or global level (LTER, GLEON, etc).

Surface ocean lower atmosphere transport processes in a dynamic planet

Christoph Garbe, Anja Engel and Emilie Breviere

Short presentation of the theme idea in the Future Earth context:

For more than a decade, the Surface Ocean-Lower Atmosphere Study (SOLAS) has fostered cutting-edge research in air-sea interactions, facilitating communication, coordinating and directing research, and advocating for new projects. The SOLAS program has facilitated major advances, changing fundamental understanding in a number of subjects, including the significance of ocean acidification, the roles of DMS and marine organic matter in atmospheric chemistry, and the importance of sea-ice biogeochemistry in controlling air-sea exchange. At the same time, the significance of earth system science to society has become increasingly apparent. Anthropogenic impacts on our earth system are becoming increasingly significant. Most of the transport between the two big compartments ocean and atmosphere are governed by the transport across the atmosphere ocean interface. These transport processes are strongly influenced by the dynamics of the interface and biological activities. This is a highly coupled system, which will be very sensitive to climate changes and global warming. Changes in the transport between atmosphere and ocean will have far reaching effects, influencing ecosystems and air quality to name but a few. Due to these effects, processes at the air-water interface will have a direct relevance for social sciences and economics.

This theme will focus on the following topics:
1) Greenhouse gases and the oceans
2) The air-sea interface and fluxes of mass, energy
3) Atmospheric nutrient and particles supply to the surface ocean
4) Interconnections between aerosols, clouds, and ecosystems
5) Ocean emissions and tropospheric oxidizing capacity
6) Interconnections between ocean biogeochemistry and stratospheric chemistry
7) Multiple stressors and ocean ecosystems
8) High Sensitivity Systems-HS2

Besides increasing our knowledge and understanding in a dynamic planet, the SOAS community can directly facilitate four types of services:
1) supporting services such as O2 production, CO2 sequestration, nutrient cycle and primary production
2) regulating services such as climate regulation, air quality and waste treatment
3) provisioning services for food, raw materials and genetic resources
4) cultural services through recreation, inspiration and cognitive development
SOLAS makes a significant effort of knowledge dissemination and capacity building. This will be of particular relevance for research in FE, since a strong effort will have to be made in order to bridge the gap between natural and social sciences and learning each others languages.

In the context of future earth, SOLAS will make a significant contribution towards „dynamic planet“, „global development“ and „transformation towards sustainability“. In the theme proposed here, we would like to discuss possibilities of a strong engagement of stakeholders, ranging from social science, economics, and politics, leading to a co-design of true transdisciplinary research.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The German community of the SOLAS project is currently very well organized through the BMBF-funded SOPRAN initiative. This is currently limited to natural sciences. Through this theme, strong collaborations in the SOPRAN community will be used and extended to include new partners from social sciences. First connections have been made already through some local initiatives. Therefore, this theme has a high integrative potential of closely linking natural and social sciences, building up on very successful previous organization structures.

Short description about of the internationalization potential of the suggested theme idea:

The SOLAS community is very well connected and internationally organized. This includes countries from all continents, ranging from developed to developing countries. This is obvious from the participation of the SOLAS Open Science Conference and the SOLAS Summer Schools. The Theme proposed here is central to future SOLAS actives, for the next ten years of the SOLAS project. Therefore, the potential of internationalizing this theme is very high and will likewise lead to the acquisition of funding from national and international funding.

Dealing with complexity: A synthesis approach to a global change hotspot

Elisabeth Krueger, Helmholtz-Zentrum für Umweltforschung - UFZ
Helmholtz Centre for Environmental Research - UFZ

Short presentation of the theme idea in the Future Earth context:

Assessments of the global socio-environmental system suggest that due to climate change, a growing earth population, and the related rising demands for water, land, food and energy, pressures on society and ecology will continue to increase. All these aspects of change and the resulting impacts will not be equally distributed, but rather will occur with highly differentiated shape in time and space. Dramatic shifts occur when change processes of a number of system elements are concentrated either in space, referred to as "hot spots", or in time, referred to as "hot moments". The Mediterranean region has been identified as such a global change "hot spot". For example, climate and water availability assessments suggest that the Mediterranean is one of the most imperilled regions in the world concerning present and future water scarcity. Climate and extreme event projections from climate models for the Mediterranean are, unlike for most regions worldwide, consistent in their trends based on various scenarios. This consistency in the model predictions shows that the Mediterranean will face some of the most severe increases in dryness worldwide, and indicate a decrease of up to 50 % in available water resources within the next 50-100 years. These developments are accentuated by the fact that in many of the Mediterranean countries, natural renewable water resources are fully exploited or over-exploited already today, mainly due to agricultural irrigation, but also touristic activities. At the same time, the Mediterranean region is a global hot spot of freshwater biodiversity, with a high proportion of endemic and endangered species.

With regard to temporal concurrence, the recent socio-political eruptions in a number of Arab countries have shown with little surprise, that the surpassing of the threshold point between stability and social unrest can in fact be triggered by factors that are seemingly beyond the system boundaries (such as crop failures in Russia leading to rising wheat prices on the Egyptian market – probably having been the last straw to break the camel's back).

However, speaking of the Mediterranean region as "a hot spot" can be highly misleading. The region is delicately positioned at the crossroads between East and West, interlinking Europe, Asia and Africa. The Mediterranean region is a highly diverse area in terms of population density, culture, economy, as well as in terms of water availability, ecology etc. While trend projections for water availability and climate change derived from global studies are consistent, regional patterns and heterogeneities, as well as local adaptation measures will largely determine the functioning of societies and the health of ecosystems. Adaptation measures targeting projected change processes "for the Mediterranean region" will have to address the multi-facetted character of the region. Global scenarios with a coarse resolution in space and time, and generalized solution approaches neglecting the heterogeneity of this region will go astray. It will therefore be necessary to observe, explain, understand and project the very different dynamics of the natural phenomena and human activities of this region that is often described in a very simplified way as "a hot spot".

As a result, three lines of research are suggested, requiring multi-disciplinary, however focused research approaches:

1. How do global/regional scale changes translate to the local scale? What makes a region or local system robust, while another is likely to reach a critical state with the risk of collapse? What are the system boundaries (can spill-over effects be anticipated and/or taken into account)?

2. How can a global change hot spot, being at risk of crossing critical threshold values leading to a collapse of the system, be identified: Can we develop "hot spot indicators"? Can this knowledge be used to detect emerging "hot spots/hot moments", and to induce measures to avoid the system ending up in states threatening the future development of society, including political failure, but also the collapse of ecological systems threatening the health and livelihoods of people?

3. Global change hot spots are always characterized by a number of factors interacting, leading to a high complexity and the fragility of system stability. The questions that need to be addressed here are: What are the main factors determining systems' vulnerability and/or resilience? How can system complexity be dealt with? What is a systems approach offering appropriate agendas for research and management?
Measures aiming to stabilize the system or to mitigate the effects of abrupt and radical changes of the system therefore need to focus on the most sensitive, however diverse, factors, in order to derive effective measures.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

There is a high potential for different communities within Germany to contribute to this research topic. The topic suggests highly interdisciplinary research approaches, including a wide range of natural sciences, engineering, and the humanities. The suggested topic can be described as a „grand challenge" facing society, as it deals with global, as well as regional dynamics of the natural and the socio-economic environment. Contributions are expected from a range of research institutions, including non-scientific institutions such as the Helmholtz Centres in the research field Earth & Environment, Leibniz Institutes, Max-Planck Institutes, etc., as well the universities.

While the Mediterranean region is suggested as a research focus, due to recent socio-political developments in the region, co-inciding with findings of observable and anticipated impacts of climate change, theories, methods, and management strategies targeting complex, dynamic systems and developed within the frame of this research topic, shall also be applicable in other regions.

The impacts of global change have to be taken seriously by politicians and decision-makers. However, the question of how to deal with fragile states and regions cannot be answered in a simple manner, but needs informed policies. With this research topic, the scientific community can offer systematic guidance to complex socio-environmental challenges.

Short description about of the internationalization potential of the suggested theme idea:

The described topic is an international one per se.

Space Based Solar Power – The next game-changer for Global Energy strategic security

Maria C Pou - B P & Partners

Short presentation of the theme idea in the Future Earth context:

Space based Solar Power (SBSP) Is a disruptive technology that is the paradigm of renewable energy resources, 24/7 efficient services, global access. SBSP has a 99.3% capacity factor, reduced CO2 impact that does not consume water. With current advanced technology and cross-national financial structures space solar power becomes a truly long-term energy solution.
The presentation will provide a clear understanding of the current development status of Space Solar Power and its implementation forecast from different contexts:

ADVANCED TECHNOLOGIES involved (focusing on the most directly involved with Energy Transmission, orbital construction, transportation, new materials). Challenges and solutions.

INSTITUTIONAL AGENCIES and assimilated, their programs and status. Including European Space Agency, German Aerospace Center, United States National Aeronautic s and Space Administration, United Kingdom Space Agency, Japan Aerospace Exploration Agency, China National Space Administration, Russian Federal Space Agency, Indian Space Research Organisation, (mention apart are several regional initiatives).

RESEARCH, ACADEMIC AND EDUCATIONAL institutions, leading the most advanced technologies that will make possible the scaling-up process. Identified most suitable techniques to overcome the most challenging scientific-technical issues.

Power Transmission Designs | transportation | satellite communication techn. | orbital installations | weather and metrology | tele-construction and maintenance | Tele-robotic construction | physical structures | energy transmission technologies | Debris…

FINANCIAL INSTITUTIONS, financial engineering and Public-private sectors partnerships and innovative structures.

REGULATORY FRAMEWORKS, POLICIES, LEGAL ISSUES, gaps and challenges. International agreements, regulatory mechanisms.

INDIRECT BENEFITS global sustainability impact | Natural disaster prevention and action | Scientific research | New technologies

GLOBAL SOCIETAL impact and benefits.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany hosts one of the leading most advanced scientific research community, being specially prolific in most advanced technologies in the sectors that are directly involved in the development and implementation of SBSP for Earth energy providing, will be critically involved in the process to become a reality. Moreover, SPBP will position Germany as a global leader in the sector, so Germany will impact the global community.
Germany is a role model in Sustainability that, with radically eliminating nuclear energy from its portfolio of energy sources, will be recognized as the leading Country in years to come.
Germany is leader in the development of Renewable Energy most sophisticated technologies, leading the industry in this sector globally. The German industry will have a critical role in the development of this technology that will make possible the SBSP.
Germany is a leading European force in aviation and Space Transportation (Deutsches Zentrum für Luft- und Raumfahrt e.V. –DLR- | ASE; German: Europäische Weltraumorganisation)
The impact of SPBP in German communities will be impressive : Scientific community, Industry sector, Patent sector, Financial sector, Academic and research community, public sector for global prominence, job creation and economy dynamization.

Short description about of the internationalization potential of the suggested theme idea:

Not only when SPBP will be operative, but even during the implementation process, it will bring very important benefits to almost all sectors.
Efficiency and reliability | Global coverage of energy | Energy price stability factor | Scientific Community increase support | Unlimited energy resource | Poverty alleviation | Contribution to post Rio+20 Sustainable development Goals achievement | Economies development and dynamization | Facilitate cross-national and cross-regional governments' dialogue, becoming a contributor to Peace and conflicts avoidance

Understanding and solving land use conflicts across scales - Identifying strategies to balance land use and conservation goals using place-based research along global gradients.

Ralf Seppelt, Aletta Bonn, Joern Fischer, Tobias Kuemmerle, Henrique Pereira, Christian Wirth, Stefan Klotz

Short presentation of the theme idea in the Future Earth context:

During recent decades, there have been parallel scientific debates regarding the effects of land-use on synergies and trade-offs between biodiversity and ecosystem services (ES). These discussions continue while the pressure on the limited resource land is increasing due to society's growing demand for food and energy and the need to halt biodiversity loss and maintain ecosystem services increasingly becomes more apparent. There are options for agro-ecological intensification, which sustain ecosystem services, reduce environmental costs and maintain biodiversity through wildlife-friendly farming. At the same time it goes without saying that further uptake of land comes with costs on ecosystem services and tremendous biodiversity loss. Losing biological diversity is impacting on ecosystem services, which may result also in increasing prices for crop production, even at a global scale. These processes however need to be examined, understood and managed at the regional scale, e.g. through place-based projects, while they clearly have global significance. All these feedbacks are key for achieving food security, which is key to poverty alleviation and thus for global sustainability. Beyond simple increase of production and provisioning of services, land use discussions as well as scientific analyses mostly lack consideration of ecosystem properties, such as stability and resilience, and often fail to embed socio-economic constraints of the land use system at multiple scales. Acknowledging that all this needs to be accompanied by better management of food provision (reduction of waste, better distribution of food and shifting diets), the core task for maintaining biodiversity on a "cultivated planet" is to identify land use strategies that balance land use and conservation goals using place-based research along global gradients.

Yet to date we have failed to produce a robust and generally applicable framework for analysing synergies and trade-offs between land management, ecosystem services and biodiversity outside a set of confined conditions across scales. Moreover, recent discussions have often adopted a dichotomous perspective (e.g. land sharing vs. sparing), thereby falling short of yielding results that can be applied in environmental management. Land sharing may utilize the overwhelmingly positive effects of biodiversity on ecosystem functions and services, while land sparing largely ignores this important mechanism. When trying to answer the question "What are the best strategies to safeguard provisioning services at the least harm to biodiversity, regulating and cultural services?" we need to move away from a simplifying "either-or" perspective to address this complex problem.

We need to acknowledge that there is no "on size fit all solution". Full consideration of the socio-economic and environmental system need to be embedded in place-based analyses . Research therefore needs to provide answers to the following questions:

- How are biodiversity, ecosystem functioning and ecosystem service provisioning interlinked at the plot, landscape, regional, and continental scale? There is, for instance, a lack of knowledge on the relationship between functional biodiversity and provisioning of ecosystem services but also the stability and resilience of system across scales.
- How do these relationships differ for different landscape and regional contexts, and with respect to contrasting land use strategies (e.g., land sparing versus land sharing)? Trade-off analyses so far rarely consider spatial heterogeneity, nor trade and leakage effects – while these effects are becoming more important rapidly.
- What would be suitable instruments in economy, education or governance to manage land use at the various scales? We hypothesize that scientific findings will only be of use if the characteristics of the socio-ecological system at hand are considered, optimally in a co-design-like concept . Neglecting the socio-economic constraints inhibits transferability of results and findings.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany's research landscape is well situation to go ahead in this direction as it provides cutting edge research by the German Centre for integrative Biodiversity Research (iDiv), various DFG funded SFBs, EU-IPs (VOLANTE, OPERAS, Openness) and the large-scale research program on sustainable land management with its 12 regional projects on these issues. In addition, initiatives such as the long-term ecological results sites (LTER) support this work.

Short description about of the internationalization potential of the suggested theme idea:

We propose tackling these questions by implementing and conducting synthesis work across various spatial and temporal scales along global gradients taking best practice examples of synthesis centres such as SESYNC, NCEAS, sDiv as blueprints. This conceptual synthesis acknowledges the multi-dimensional complexity captured in the label "land-use" in relation to biodiversity and ES. Secondly, we envisage a synthesis of data from place-based studies on biodiversity and ES that explicitly report on land-use conditions across various scales and various case studies across the globe. This analysis becomes possible only if transferability of results and finding is supported using consistent global scale categorisation of land system pattern, which capture key indicators of the socio-environmental system or consistent global scale scenarios.

As studies that address the various facets and dimensions of land-use are relatively limited, we see a high potential fostering a comprehensive overall picture. This will allow for syntheses along the lines of the research questions state above. Results will inform land-use practice and policy such as IPBES, the Intergovernmental Platform on Biodiversity and Ecosystem Services, and accompany on-going research networks in FutureEarth such as the Global Land Project (GLP), or the Programme on Ecosystem Change and Society (PECS).

Green and social: Managing synergies and trade-offs between environmental sustainability and social inclusiveness

Markus Loewe, Carmen Richerzhagen, Katharina Stepping,
Deutsches Institut für Entwicklungspolitik (DIE)

Short presentation of the theme idea in the Future Earth context:

Existing development pathways need to be transformed so that they are more environmentally sustainable and socially inclusive. Development processes that do not target poor people, that do not regard the environment and that do not consider the temporal dimension behind these processes will have high future costs. In the worst case, the long-term negative effects will destroy the societal, economic and environmental progress previously achieved. To be environmentally sustainable, development must be reconciled with planetary boundaries. To reduce poverty, development must be inclusive, such that it benefits all members of society. Environmental sustainability and poverty reduction can be synergistic or conflicting. For instance, solar panels can give poor people access to low-carbon energy. Meanwhile, ecologically sustainable energy or food production may increase costs and consumer prices, or production of biofuels may crowd out food production, thereby compromising food security. Despite the rhetoric of integrated frameworks and pathways, social and environmental policies continue to be designed and implemented by separate and often disconnected government bodies, rather than one coherent policy framework navigating both. Even in research, the social and environmental communities often lack exchange and interaction.

Environmental-oriented policies may have positive or negative impacts upon poor people. For instance, improved water and sanitation facilities may imply changes in access, availability and affordability with both positive (e.g. better quality) and negative effects (e.g. higher prices) for the poor. The conversion of land into an environmentally protected area may limit access to natural resources such as water and land. In the short term, this puts pressure on the local population to migrate or otherwise adapt their livelihoods. Yet, in the long term, such protection may generate new (and even better) income opportunities for the local population such as high-end tourism due to a unique flora and fauna. Subsidies for clean technologies or stricter environmental standards can increase the price of goods and services. Vice versa, poverty-oriented policies can have positive and negative effects on the environment. Waste disposal systems and sewage systems in slums decrease environmental pollution and significantly improve the living conditions of poor people. Additional housing may affect ecosystems and put pressure on land and water resources. Energy subsidies may enable energy access but the artificially lowered price for energy offers little incentive to save energy.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

N/A

Short description about of the internationalization potential of the suggested theme idea:

The German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) is one of the leading research institutions and think tanks for global development and international development policy worldwide. It disposes of an extensive network with governmental and academic partner institutions, both nationally and internationally. This network allows for easy access to local decisionmakers and other relevant stakeholders and for research embedded in the reality of developing countries.

The ocean and coastal societies: Pathways towards sustainable development

M. Quaas, J.Schmidt, R. Voss, A.Kropina, B.Neumann

Short presentation of the theme idea in the Future Earth context:

Coastal areas face increasing populations globally, as recognized and studied in adaptation research in the framework of global change. Coastal societies and economies strongly interact with the ocean. Rural coastal economies depend to a large extent on marine resources, such as fisheries. Urban societies, in particular in megacities, face challenges of subsidence combined with sea-level rise, and the increasing frequency of natural hazards from the ocean such as storms and flooding. Increasing population density in coastal areas increases the pressure on coastal resources, including space and the natural environment, and also increases the population and economic assets vulnerable to environmental risks. This poses the question of how to plan sustainable development in highly populated urban areas. However, in many cases population increase tends to concentrate in certain areas, e.g. new megacities, while other areas suffer from population decline. Therefore, many policies, including e.g. the European Maritime Policy, put also special emphasize on rural areas. Although the needs of urban and rural areas might differ, the connectivity through the marine environment and the specificities of many marine industry sectors, e.g. transport and fisheries, connect theses areas.

We suggest a research programme with focus on the understanding of economic and social development of coastal regions taking into account environmental constraints. Results will support sustainable transformation of coastal regions. The established framework is the ecosystem approach to management (EAM), including tools like marine spatial planning. A key challenge towards implementing EAM is identifying trade-offs among multiple ecosystem goods and services and to bridge the inherent conflict between different sectors. A major scientific question is how to develop this framework in a dynamic natural, economic, social and political environment. Furthermore it is unclear which role specific sectors can play for the development in different coastal regions. One prime example is the role of fisheries for small rural communities.

Research in this area needs to be interdisciplinary, including natural and social science. However the planning process must be a transdisciplinary endeavor, developing the role of stakeholder-science-expert interactions and networks as well as the governance system in delivering sustainable developments and transformations.

This research theme is also important in the light of the current international policy development. Since Rio +20 and the document „the future we want“, ocean and coasts are in the focus of many international activities. The first World Ocean Assessment, to be expected in 2014, will shed light on the state of the world ocean and coasts and also identify gaps in knowledge and capacity.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The interdisciplinary nature of the research theme makes it interesting to a broad range of scientists from natural sciences to social sciences and economics. The regional focus on coasts does not necessarily limit the scope to scientists from marine research fields. The development of coastal areas and specifically the marine space under consideration of the natural environment is core to the current set of EU directives, including specifically the Marine Strategy Framework Directive (MSFD), which has to be implemented in the coming years and which has to ensure a Good environmental Status of the marine ecosystem. Further the Common Fisheries Policy (CFP) of the EU emphasizes the importance of rural coastal communities and calls for specific measures supprting these within fisheries management plans. Thus research endeavour will be necessarily directed towards the proposed theme to support these directives and policies.

Short description about of the internationalization potential of the suggested theme idea:

This research theme is of global nature as the sustainable development of coastal communities is of core interest to all countries with coasts. Furthermore, as already stated in the proposal, the development of the Sustainable Development Goals as successors of the Millenium Goals focus on the sustainable development with specific considerations of the limits of the natural environment. Thus research in this area will be focus in the next ten years.

Livestock: Linkages of production, environment and global cycles

Susanne Rolinski, Jens Heinke, Isabelle Weindl (Potsdam Institute for Climate Impact Research)

Short presentation of the theme idea in the Future Earth context:

Global livestock production is maintained by using tremendous resources of land, water and biomass and has substantial effects on the fluxes of water, carbon and nutrients. While introducing green-house gases into the atmosphere in comparable magnitudes to the transportation sector, livestock rearing is a vital part of the agricultural system facing the challenge to provide sufficient and nutrient-rich diets for a growing world population. Agricultural production will be constrained by manifold effects of global change, where the need to mitigate and to adapt to climate change are certainly two prominent aspects that bring livestock more and more into the public and scientific focus. To balance out impacts and benefits of livestock production, there is indeed an urgent need for an integrated and transdisciplinary framework bridging the gap between biophysical constraints and socioeconomic implications. The manner in which livestock related trade-offs are tackled, also touches questions of social justice as well as environmental and animal ethics.

Integrated impact assessments of the livestock production sector are in progress for only a few years by only a few groups (e.g. at FAO, ILRI, IIASA). The linkages of crop and pasture productivity, animal health and productivity, feed trade and meat industry to global cycles of water, carbon and nutrients do not facilitate process-based and dynamical investigations. In order to establish robust estimates of the net effects on emissions, land requirements and water use, major trade-offs and feed-backs have to be included into these assessments.

The goals of this topic are therefore

- Reliably assess current impacts of livestock production
- Develop strategies for sustainable feed provision and meat supply
- Assess mitigation options for livestock related GHG emissions
- Revisit the role of herbivores on global carbon and water cycles

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Integrative potential lies in ethical and moral jugdements of meat consumption, food provision and animal health and wellbeing. As nutrition has a considerable social dimension and is one of the most fundamental binding between generations, dietary patterns are driven by economic or intellectual considerations only to a minor extent. Here, the analysis of consumer choices under their local constraints can reveal pathways to the realization of more healthy diets in poor as wel as in rich communities.

Short description about of the internationalization potential of the suggested theme idea:

Global Food Security is per se an international topic and current discussions at the international level center more and more around the provision of animal-derived proteins under the existing and even more binding constraints on their production, availability and utilization. Recent assessments on the impacts of livestock production (Livestock's long shadow, FAO) and the inherent mitigation options (Tackling climate change through livestock, FAO) underline the need for studies which incorporate feed-backs between land and water use, feed production and trade, pasture management and human animal calorie demand. Already under way are modelling intercomparisons not ony for crop models such as AgMIP (and related ISIMIP-efforts) but also for pasture and livestock modelling (MACSUR and AgMIP links).

Deliberation on Sustainable Development Trajectories in South/East-Asia

Prof. Dr. Martina Padmanabhan

Short presentation of the theme idea in the Future Earth context:

Values and belief systems differ as do means to articulate interests and enforce them. The need to deliberate about sustainable development goals and reconcile differing and contradictory stakeholder groups is a central challenge to bring about sociateal transformation. Especially in areas like South and Southeast Asia, where rapid economic growth changes the face and structure of societies as well as the environment, forms and formats of leading discourse and deliberation on sustainability pathways are yet to be identified. Influenced or hampered by less or more democratic governance structures, the question arises whether western ideals of democratic deliberation on sustainable development goals in fact appear as a farce or whether these stratified, plural and hierarchical societies must seek culturally acceptable ways of negotiating priorities and develoment pathways. To support the emerging critical environmentalist and social voices in regimes, discourse beyond the control of elites must be sought. Similarly we need to understand the frame for unsustainable resource extraction accompanied by high social, environmental and economic costs.

The idea is to explore avenues for societal deliberations on development controversies like gender equity vs socially accepted hierarchy, indegenous vs elites, centre vs periphery and search for means and methods to carry out transformative planing and visioning without being looked in overarching powerstuctures.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

DGH Deutsche Gesellschaft für Humanökologie
Nachwuchsgruppenleitende aus der Sozial-ökologischen Forschung
Südostasienwissenschaftler
Marine Tropenökologie

Short description about of the internationalization potential of the suggested theme idea:

Zusammenarbeit mit Institutionen

in Indien
M.S. Swaminathan Resarch Foundation, Chennai
ATREE, Bangalore
Univeristy of Pondicherrry

in Indonesien
Universitas Indonesia
CIFOR
ICP Bogor

In Malasiya
Universitas Malaysia

The Role of Green Infrastructure and Water Sensitive Urban Design in Tackling Water Scarcity and Floods

Bernd Eisenberg, Lisa Deister

Short presentation of the theme idea in the Future Earth context:

The Role of Green Infrastructure and Water Sensitive Urban Design in Tackling Water Scarcity and Floods

As a result of the urbanization processes, on a global scale, half of the world's population is already living in urban areas in conditions that often lack fundamental ecosystem services. According to the OECD, over 2.8 billion people (43% of total population) were facing severe water stress in 2005 and the number is expected to increase by 2030 to 3.9 billion (47% of total population) (OECD 2008).
The rapid and often uncontrolled urbanization of cities in water scarce regions threatens to impact severely on the natural and man-made water cycle and creates even more challenges regarding a secure and healthy water supply. Therefore, new planning and design approaches also in those areas, where water scarcity is not as extreme or does not play such a decisive role in the first place (due to availability of technical solutions) are needed. Hence a water oriented urban planning which is guided by green infrastructure thinking is considered to play an important role in order to provide a better understanding of „how to live both comfortably and sustainably in an arid climate while doing minimal harm" (Aronson 2008).

The concept of green infrastructure proposes an interconnected network of man-made and natural open spaces systems that provide and conserve a diverse range of environmental, social, recreational, psychological, public health and economic benefits (McMahon & Benedict, 2001). Ideally green infrastructure guides the urban development and enables the lasting protection of natural resources and ecosystem services, including for instance water related services like filtration, purification, retention of surface water and re-charge of groundwater.

The Water Sensitive Urban Design (WSUD) concept and practice presents an interdisciplinary cooperation of water management, urban design and landscape planning. Its innovative approach considers both planning and design aspects when dealing with water infrastructure and related environmental resources on various scales (McAlister, 2007 p. 12). It proposes integrated strategic, conceptual, design and technical solutions that are tested and refined in practice. With regard to this topic WSUD needs to be expanded and modified to cover flood protection issues in temperate climates as well as water re-use in arid regions.

The proposed topic tries to bring together the research and action fields of Green Infrastructure and Water Sensitive Urban Design and seek for ways to enhance their adaptability to divergent social, economic and natural condition. It focuses on the more immediate challenges of sustainable urban development and fits therefore into theme 2 "Global Development" and its central question: "How can we ensure sustainable access to food, water, clean air, land, energy, genetic resources and materials for current and future population?"

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Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Green Infrastructure is a topic among the German planning community and among environmental as well as ecological disciplines. It has a fairly long tradition in Germany under the guise of landscape planning and is embedded partly in the planning system. Although multifunctional by nature the combination with Water Sensitive Urban Design, which brings together strategic, planning and design aspects, promises a new impetus and stimulation for innovative concepts within a German/European context and beyond.

With regard to the integrative potential of the topic two main points have to be mentioned. Firstly the term infrastructure in combination with environmental and ecological issues is still controversial and further refinement of the term with regard to the continuum from manmade to natural environments is needed. Secondly the "greening" aspect of green infrastructure is questionable. Especially in arid and semi-arid regions, but not only there, the un-reflected transfer of the idea of greening = beautifying public spaces leads to potential conflicts about water provision.
Close cooperation between social and cultural science, planning disciplines and water management is needed in order to develop sustainable ways for a culturally adapted integrated concept for green infrastructure and water sensitive urban design to tackle water scarcity and floods.

Short description about of the internationalization potential of the suggested theme idea:

The topic is applicable to industrialized, emerging and developing countries. Ahern & Pelligrino see green infrastructure as a great opportunity to re-build aging infrastructure in the developed world and consider it a unique opportunity to emerging cities "to 'get it right the first time' and 'leapfrog' the modernist/industrial phase of mono-functional, low-performance industrial infrastructure – and start de novo, with a multifunctional high-performance green infrastructure" (Ahern & Pellegrino 2012, p. 182).

A water oriented urban planning and design is urgently needed in arid and semi-arid regions which will face increasing water scarcity in the future due to climate change as well as fast growing populations, increasing international competition for water resources and mismanagement of the resources. A special focus lies in the MENA region but the interest is not restricted to the area and not only to dry regions of the world.

A Four-Pronged Approach to Global Development with Open-Source hardware and software

Jose Gama

Short presentation of the theme idea in the Future Earth context:

A Four-Pronged Approach to Global Development with Open-Source hardware and software Open-Source hardware and software can be a powerful tool to assist Global Development.
There are four areas where Open-Source can play an important role:
1. Inexpensive devices for medical care.
2. Inexpensive devices for water purification, pest control, energy control and so forth for food production.
3. Equipment and methods for monitoring environmental variables.
4. Measuring devices and other equipment for scientific research or education.

Health is an universal Human right and it is essential for the well-being of an individual which will reflect in the individual contribution to social and economic development. Proper health care requires qualified personel and professional equipment. The latter can benefit directly from Open-Source tools, from heart rate monitors to medical record applications and even epidemiological analysis applications.

Food and water should be available to everyone, ideally in quantity and quality as to inexpensively provide balanced nutrition, free of contaminants and produced in a sustainable fashion. There are many electronic devices involved in food production and water management for drinking or irrigation. Some devices read values from sensors, other devices control other systems based on a program written by experts that might take as parameters the data from sensors. For example an automated irrigation system controlled by a program that turns on a water pump based on the air temperature and humidity, and soil moisture sensors.

Monitoring environmental variables can be very challenging, from sensor networks that cover vast areas in the ocean or in land to radio tracking of moving animals. Sensor networks consist of multiple sensors distributed over a spatial area and converting chemical or physical information to a numeric digital form that can be stored or transmitted by wire or wirelessly. These networks can be expensive because of the high number of elements and because many elements are lost or damaged in the field. Open-Source has both advantages of low cost and avoiding vendor lock-in. Low cost might be secondary because the price of a quality sensor is often much higher than the electronics for storing or transmitting the data. The problem of vendor lock-in is more than a matter of cost, it might be an obstacle to interoperability of data, software or hardware. These obstacles are unaceptable in a global prespective because data and knowledge must be shared freely to fight global problems. The new global threats such as an increase in intensity or frequency of extreme events require technolgies that cannot be monopoly of nations or corporations because there is no room for profit or political barriers when dealing with the possibility of a disaster. Extreme events can be very destructive to both Human societies and to the environment. Warning systems can be made safer if the blueprints are afreely available so that everyone can contribute.

Scientific equipment for research or educational purposes has always been expensive because of the special materials and precise construction methods. However, many components of modern equipment are based on inexpensive electronics and others can be built by using CNC or 3-D printers that are becoming more accessible to everyone. Developing nations want and need to invest in technology and education and Open-Source can provide the necessary tools at the lowest cost and with great flexibility of use. Open-Source ensures, by definition, reusability because its products can be easily maintained, repaired or upgraded. There are less chances of waste, in terms of obsolete equipment to be disposed of or wasted development time. This can be a way to slow down the exponential growth of e-waste, which is a threat to a sustainable world.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany has many people from both universities and the industry not only using Open-Source but also contributing to Open-Source projects.
There are no restrictions in Open-Source, anyone can join in or use without any form of discrimination. The potential of natural and social sciences can be integrated through Open-Source and an example of it is the statistical environment R, which has thousands of packages, which are extensions of its functionality, for natural and social sciences. There is no distinction and they can be used together with no extra effort.

Short description about of the internationalization potential of the suggested theme idea:

Open-Source projects are often developed by international teams and for a global audience. There is always an interest on the internationalization and localization aspects of every product because it should work in most operating systems, in most computers, anywhere in the world.

Benefits of the sustainable intensification of small-scale food production

Vera Tekken

Short presentation of the theme idea in the Future Earth context:

The co-evolutionary process of humans and nature has created intensively managed land use systems all over the world. These cultural landscapes are not only food production systems and the expression of specified land use strategies but inherit particular cultural values and have influenced and formed social structures. Increasingly, in most developing countries, in the course of a rapid economic catch-up development, direct and indirect driving forces impinge on the functional connections of these social-ecological systems and thus on landscapes, its typical patterns and biodiversity, its functions and services, and its people. For example, in Asia, subsistence production contributes to rural food security and to the conservation of traditional farming practices and agricultural knowledge. And with this it contributes as well to the preservation of cultural landscapes, to environmental integrity and social stability. Given many new challenges owing to globalization effects, traditional subsistence farming systems need to be adjusted and production has to be intensified in a sustainable manner. However, a modified approach of agricultural modernization is needed, which is not following the style of the Green Revolution that has been causing severe damage to soils, biodiversity and genetic (crop) variety. Connected with this loss of environmental diversity and health is the loss of living quality. Current degradation processes increase poverty and lead to the loss of (fertility) of agricultural land. Measures to counteract this process are mainly based on laboratory experiments instead of a reconsideration of sustainable traditional farming practices of local farmers. Further, revenues from agricultural production are too low to suffice as sole family incomes. Such, on the one hand subsistence production is indispensable for food security; on the other hand it does no longer cover the cost of living. Could, for example, the application of the principles of Ecological Engineering, an ensemble of tools to enhance natural resilience against pests, support the sustainability turn in agricultural production of developing countries? How could it help to increase farm incomes? Could it help to create an awareness and trust into the self-healing powers of nature? What is needed for the implementation of principles of a sustainable agricultural production in developing countries in order to enhance environmental resilience and to support rural livelihoods?

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Das Thema fokussiert auf das Potential des Ansatzes des Ecological Engineering zur Sicherung der Nahrungsmittelproduktion in kleinbäuerlichen oder kollektiven Subsistenzsystemen. Ecological Engineering strebt einen Perspektiven- bzw. Paradigmenwechsel an, basierend auf der Selbstorganisation von Ökosystemen anstelle der dekonstruktiven Modernisierungsstrategie der Grünen Revolution, deren prinzipiellen Ansatz die Hchleistungs-Agrarwirtschaft bis heute folgt.
Nachhaltige Landnutzung und Lebensmittelsicherheit sind eng miteinander verknüpft, da die Fruchtbarkeit von Böden rapide abnimmt. Nach wie vor sind Kleinbauern die Säule der Lebensmittelproduktion weltweit,daher ist es wichtig, die natürliche Resilienz dieser Systeme zu stärken, nicht nur um dadurch Einkommen zu sichern und Abwanderung zu stoppen, sondern auch um Agro-Biodiversität zu erhalten.
Akzeptanz für die Einführung neuer Landnutzungsprinzipien bei Entscheidungträgern aber auch bei Bauern erfordert eine inter- und transdisziplinäre, aber vor allem partizipative Herangehensweise. Die Zusammenarbeit von Natur- und Geisteswissenschaftlern ist daher wichtiger Erfolgsfaktor für eine Implementation.

Short description about of the internationalization potential of the suggested theme idea:

Nachhaltige Landnutzung ist ein globales Thema. Agrarproduktion ist prioritäre Lebensgrundlage, und der Trend zu Intensivierung führt bereits spürbar zu Qualitäts- und Versorgungsproblemen. Viele agrochemische Produkte verschlechtern Boden- und Produktqualität, oder führen zu schwerwiegenden Gesundheits- und Umweltproblemen in den Produktionsregionen. Es ist eine Frage gesellschaftlicher Verantwortung und Ethik, alles zu unternehmen, um die negativen Folgen unnachhaltiger Produktion zu beseitigen und Schäden vorzubeugen. Es ist interessant zu verfolgen, welche Ländern ökonomische Nachteile zum Schutz von Umwelt und Ressourcen in Kauf nehmen: Entwicklungsländer oder (Post-)Industrieländer?

Water and sustainable urban futures and landscapes

Angela Hof, Geography Department, Ruhr-Universität Bochum

Short presentation of the theme idea in the Future Earth context:

Freshwater is an absolutely essential natural resource for which there is no substitute, and an increasing proportion of the world population is living in areas where this resource is under pressure. The provision of safe and adequate water is one of the most pressing problems of human development and Future Earth addresses these problems in the form of a new ‚social contract' between science and society by focussing global environmental change knowledge on such anthropocentric problems. ‚Water and sustainable urban futures and landscapes' focusses on the state and role of this unique natural resource in the urban context under global environmental change. In many regions, high rates of population, urban and economic growth take place in areas with the greatest water deficits, the greatest vulnerability to water scarcity induced by climate change, and the greatest mismatch between water supply and water demand: the Mediterranean coastal areas, desert cities in the USA, the gulf region, and megacities are some examples. Complex socio-economic developments, welfare and lifestyle changes trigger phenomena such as changing urban landscaping practices and preferences, as well as higher water demand due to higher standards of living. As a consequence, urban water demand and water supply have become one of the most dynamic sectors of water resources management.

The nexus of water and sustainable urban futures and landscapes is instructive because water challenges are advanced already in many urban contexts, and social and environmental consequences crystallize locally. Urban areas often draw on distant or diverse sources of water, with severe consequences for the areas of abstraction. In many places, the privatization of traditionally public urban water management is observed and there is an urgent need to discuss how different underlying objectives (e.g. social equity, economic efficiency and environmental conservation) could be combined within a coherent implementation framework with sustainable development implications.

The following questions can be addressed by current, updated or new collaborative research efforts: What are the patterns and processes of appropriation and transformation of land and water through urban change? What are the links between water demand, water consumption and urban landscape patterns and is there a danger of social polarization especially in water scarce environments? What are the links and feedback mechanisms between water consumption in urban areas, urban landscapes and ecosystem services like urban cooling, bioclimatic comfort, aesthetic value and urban microclimate moderation? Which volume of water is needed to produce these services? Analyzing and addressing the pivotal role of water for sustainable urban futures and landscapes will point to challenges and solutions for water supply under global environmental change and support holistic, solution oriented approaches to water management.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Urban areas and landscapes are in the focus of research on the implications of global environmental change and at the same time, are influencing and driving this change across spatial and temporal scales through teleconnections. The issues of water demand, water use and consumption in urban landscapes are relevant to the German environmental research communities that are engaged in work at the global scale and at the regional and local scale on climate change adaptation and mitigation, ecosystem services, and water management and governance in the urban context. The integrative potential for Natural Sciences and Humanities derives from the material and cultural properties of water, which is both a renewable natural resource (and therefore, in the domain of hydrological cycles, climatology and hydrology) that is essential for life, agriculture, other industries and tourism, and at the same time a resource that is distributed, owned and governed in very different ways. Water scarcity per se is often not the main problem, but issues of access, distribution, spatial and temporal unevenness of demand and consumption are at the core of water management and governance. The topic has manifold aspects for the integration of natural and social science perspectives, such as questions of equity and governance (access to water, prices for water), as well as questions on the state and dynamics of the resource under climate change scenarios, the climatic sensitivity of urban landscapes, and ecosystem functions and services provision. For example, through urban heat island cooling effects through gardens and urban green space, as well as the provision of aesthetical and recreational urban ecosystem services. Industry and businesses are involved in technological solutions for supply enhancement (reservoirs, desalination, wastewater treatment). Another important aspect is the analysis of the water footprint of urban areas, defined as the volume of water needed to produce the goods and services consumed by urban inhabitants. Moreover, the indirect water requirements of many activities (e.g. residential uses, services, tourism) remain inadequately understood but this understanding is necessary to develop appropriate policies for the transition to more sustainable urban futures and landscapes through the reduction of direct and indirect water uses in urban areas and by urban areas.

Short description about of the internationalization potential of the suggested theme idea:

The topic „Water and sustainable urban futures and landscapes“ has international potential and relevance because urban areas are affected by and affecting the dynamics of global environmental change. The water demand of urban areas is increasingly competing with the agricultural and tourist sector at the local and regional scales in many places of the world. Anywhere where tourism is a relevant sector of the economy, the demand and competition for water appears to be rising inexorably. Climate variability and climate change exacerbate the situation. From an international perspective, the topic offers a broad range of sustainability and development aspects to be addressed across time, space, and social, cultural and political contexts: For instance, from the aspect of safe water in urban areas where water is scarce and/or the supply network in its infancy or badly maintained; to the aspect of leisure uses of water in urban areas where the excessive use of water enables ‚Atlantic‘ urban landscaping irrespective of climatic circumstances (like in desert cities). The assessment of the costs or benefits of different management and governance choices can be addressed internationally for comparison, and the contributions of the private sector are an important question to be addressed as the water utility industry is highly capital intensive, even when compared to most other utility industries.

Freshwater - Medium for Life and Resource for Humanity

Tockner, Klement; Tydecks, Laura; Hering, Daniel

Short presentation of the theme idea in the Future Earth context:

Future Earth aims to develop and improve the understanding of global environmental changes as well as to support transformation towards a sustainable use of resources. Such an important resource is the global biodiversity: It is the basis for health, contributes to food security and is important for cultural and esthetic issues. Hence, the biodiversity loss is one major challenge of our time.

There is clear and growing scientific evidence that we are on the verge of a major biodiversity crisis. Despite the increasing public awareness of the problem, few are aware of the catastrophic decline in freshwater biodiversity at both local and global scales. While freshwater ecosystems cover less than 1% of the earth's surface, they contain about 10 % of all animal species. More than 35 % of all vertebrates are restricted to freshwater habitats during at least part of their live.

Freshwater ecosystems are continuously under stress due to human induced factors. The most critical factors are the increasing exploration of rivers and streams for the generation of hydropower, the massive abstraction of water and the uncontrolled spread of alien species. Pollution and disturbances from land use change, global warming, shifts in precipitation and nitrogen deposition further affect freshwaters.

The implications to ecosystems and humans are immense because rivers, lakes, ground waters, and wetlands provide a diverse array of crucial natural functions and services; more than any other ecosystem type.

European policies such as the Habitats and Water Framework Directives as well as the Biodiversity Strategy to 2020 focus on the ecological state freshwater biodiversity and ecosystems. But economic incentives often support provisioning services like hydropower. Those replace the long-term benefits of the less studied cultural and regulatory services like carbon storage.

Scientists and water managers have collected vast amounts of data on freshwater biodiversity. Nonetheless it is often impossible to be certain of e.g. the geographic range of a species because the existing data from all of these studies are widely dispersed, gathered in locally-managed databases, many of which are not publicly available. The combination of all data, accessible to scientists, policy makers and planners can be used to improve and establish effective plans for conservation and for a better understanding of the services provided by aquatic ecosystems.

The EU project „BioFresh" aims to support scientists, NGOs, policy makers, businesses and the public in strengthening the conservation of freshwater ecosystems by building an on-line, open-access global data portal on the distribution, status and trends of freshwater biodiversity . The project's multifaceted approach has enabled significant progress in filling data gaps and furthering the knowledge and understanding of freshwater biodiversity, guiding policy debate and action and increasing public awareness and engagement by producing accessible and relevant scientific information.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

In Germany freshwater ecosystems provide important services including recreation, angling or bird watching. Furthermore freshwater ecosystems offer regulatory services like buffering against floods and erosion, maintaining water quality as well as carbon storage and nutrient cycling. Finally, freshwater ecosystems provide services including the transportation of waste and goods, non-consumptive use for energy generation and abstraction for agricultural, domestic and industrial use.
The continued degradation of freshwater ecosystems and the loss of their biodiversity cannot be accepted. Hence, it is a matter of coherence between biodiversity, water, agriculture, energy and other policies to determine whether freshwater biodiversity will be able to deliver its services in the future.
Therefore, we have to manage three major challenges in order to improve the capacity to protect and manage freshwater biodiversity: (i) to identify and compile the vast amount of dispersed information on freshwater biodiversity, and to make this information publicly available, for scientists, mangers, as well as for a general audience; (ii) to use the available data to predict future changes in freshwater biodiversity as a consequence of global change; (iii) to identify key areas for conservation and restoration, globally, in Europe and on a national level.
There is a huge potential to complement existing databases on freshwater biodiversity and distribution patterns and to link these data with geographical and socio-economic information. By developing a universally accessible information platform - how it is done by BioFresh -, it will foster our understanding of present freshwater biodiversity and changes expected for the future which is highly relevant for policy makers, scientists, planners and practitioners in Germany.
Those stakeholders in freshwater management can contribute to and benefit from the platform and thereby improve and establish effective plans for conservation on a local and national scale.

Short description about of the internationalization potential of the suggested theme idea:

The biodiversity crisis puts billions of people at risk as biodiversity loss affects water purification, disease regulation, subsistence agriculture and fishing. For example, it is predicted that by 2025 many rivers in China, India, the Mediterranean, or in Africa will not reach the sea except during floods with tremendous effects for coastal fisheries. Large rivers, for example, are the lifelines of the continents that connect land with sea as well as various biomes. Large rivers have been centres for the development of human civilisation and have served as nodes for most human activities - land reclamation, floodplain drainage, navigation, waste deposition, and biomass production. As a consequence, large rivers can now be considered as domesticated ecosystems that have been formed through and depend on human activities.

Hence, the provision of knowledge for a sustainable, secure and fair global use of biodiversity needs the combination of local and/or national datasets on a global scale.
BioFresh uses existing global data to support a broad diversity of critical needs in freshwater biodiversity management and conservation. Combining the construction of the portal with scientific research ensures an optimised product for use. Ultimately, the interoperable datasets, together with geospatial visualisation tools and predictive models, will be made freely accessible through the web portal, forming the kernel of an unprecedented global information tool to all decision makers, stakeholders and users in freshwater biodiversity.

Valuing Ecosystem Services

Katrin Rehdanz (IfW: Kiel Institute for the World Economy), Christine Bertram (IfW), Angela Kopmann (IfW)

Short presentation of the theme idea in the Future Earth context:

The dependence of humans on goods and services provided by the environment is strong and manifold. We rely on tangible goods like food and timber but also on more intangible services like water and air quality regulation, nutrient cycling and decomposition, plant pollination and flood control. The invisibility of most of these services and the fact that they do not command any price in the conventional economic system encourages inefficient use or even destruction of individual service flows. This in turn not only impacts human well-being, but also seriously undermines the sustainability of the economic system. It raises questions how the trade-off between the use of these resources in production and their preservation for the consumption of ecosystem services should be managed.

Research results from this field of research could support societal decisions on a sustainable use of natural resources (e.g. land, water and biodiversity) and balance market and non-market processes.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Researcher from different disciplines work on issues related to the topic of valuing ecosystem services but their research is often only loosely connected to each other.
This includes the following fields:
- biology
- geography
- hydrology
- climate science
- economics
- social sciences
- ecology

Short description about of the internationalization potential of the suggested theme idea:

The topic of valuing ecosystem services has a local, regional and global dimension.
Internationally, a variety of groups are working on the issue. Its relevance is highlighted e.g. by the CBD. The TEEB initiative as well as the UK Ecosystem Service Assessment are further examples.

Securing progress in crop productivity with concomitant protection of natural resources and ecosystem services

Senatskommission für Agrarökosystemforschung der DFG
Federführung: Prof. Hartmut Stützel, Universität Hannover

Short presentation of the theme idea in the Future Earth context:

Agro-ecosystems are in the conflict zone between rising needs for food and raw materials on one side, and the requirements for ecosystem services on the other. It is to be expected that these conflicts will increase under the conditions of a growing world population and continuing climate change. The demand for food and energy is predicted to increase by 60% in the coming 40 years, but for many crops yields seem to plateau, particularly in the highly productive areas and even with excessive nutrient input (Ray et al., 2013). To secure progress in crop productivity requires fundamental innovations and challenges to agricultural sciences asking to think beyond existing boundaries and to newly align agro-ecosystems research.

Research questions necessary to be answered on the way towards a sustainable increase of crop productivity arise on several levels of organization, from gene to landscape. For example, an improved understanding of the processes leading to the functions describing crop yield in dependence of resource use for different environments would allow to better identify plant traits and management options leading to high resource use efficiency. The identification of physiological and biochemical traits, the underlying genes determining the adaptation of plants to local conditions and the multiple interactions of plants with their bio-physico-chemical environment, such as plant–microorganism interactions in the soil, would be the basis for modifications and optimization of plant performance. Plant breeding is confronted with the problem how to utilize large amounts of genotypic data for predicting the performance of new genotypes under different environmental conditions. Upscaling of biochemical and physiological traits to the crop level requires a better understanding of the interactions between structure and function of plant canopies and the rhizosphere, including their adaptive potentials to changes in climate, water supply and nutrient input.

The above mentioned problems require interdisciplinary approaches ranging from molecular biology to soil biogeochemistry, landscape ecology and economics. For a combined optimization of agricultural land use, nutrient efficiency and nature conservation, the integration of the following research directions is required: i) plant breeding to combine useful traits of novel genotypes, ii) agronomy to adapt soil, water and nutrient management and to better understand canopy processes, iii) agricultural engineering to develop sensor-based technologies in crop production, iv) soil science to better understand the effects of increased productivity on carbon storage, water and nutrient dynamics, and v) biodiversity research to monitor, evaluate and predict the impact on plant and animal communities.
The relevance of an increase of crop productivity is obvious: The increasing needs of our societies can only be satisfied in a sustainable way with an enhanced use of renewable materials (Tilman et al., 2011). On the other side, it is also widely accepted that the different functions of natural resources like soil, water and air have to be preserved for future generations. The solution of the above-mentioned conflict between agricultural productivity and other ecosystem services is of fundamental importance for the development of our societies worldwide.

Ray, D.K. et al. (2013) Yield trends are insufficient to double global crop production by 2050. PLoS ONE, 8: e66428, doi:66410.61371/journal.pone.0066428.

Tilman, D. et al. (2011) Global food demand and the sustainable intensification of agriculture. PNAS 108, 20260–20264.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Enhancing future crop productivity is a trans-disciplinary topic. Not only is the involvement of German agricultural scientists of the various disciplines expected. As elaborated above, fundamental biological knowledge, e.g. in physiology and genetics, is required, and economic aspects have to be addressed on the macro and micro scales. Finally, the ecological impact of increasing crop productivity is expected to affect societal processes which would be interesting to study.

Short description about of the internationalization potential of the suggested theme idea:

The improvement of crop productivity is a global requirement and will therefore involve increasing numbers of scientists worldwide. Examples like the Wheat Initiative (http://www.wheatinitiative.org) demonstrate already, that internationally coordinated research is necessary to meet needs of societies globally.

Water-Related Planetary Boundaries as Basis for a Dedicated Sustainable Development Goal (SDG) on Water

Janos J. Bogardi, Anik Bhaduri

Short presentation of the theme idea in the Future Earth context:

By introducing the concept of "planetary boundaries" (PBs) Rockström et al [Nature, 2009] triggered considerable scientific and public debate. While not claiming to be exclusive measures of sustainability, PBs are recognized as metrics defining a "safe operating space" for humanity. How long, if at all, "business as usual" can be continued? How can boundaries be defined and their transgression prevented? How many and which boundaries need to be defined and observed to keep the world on a sustainable track? These and similar questions can be answered through the perspective of PBs. Rockström et al. identified several dimensions and proposed (except for two dimensions) global indicators and threshold values.

They also recognized that the selected dimensions are not independent. Through the hydrological cycle freshwater use is linked to arguably all other dimensions. Therefore, any single boundary estimate for water is particularly problematical. There are additional limits to the original concept applied to water, including uneven distributions in time and space and entrenched local-scale management perspectives. The current absence of limits recognizing the impact of impaired water quality and/or technological interventions and governance concepts also limit the current PB concept as applied to water.

While identifying PBs is essentially a scientific task, their acceptance is fundamentally a societal process reflecting human perspectives. PBs are inherently value judgments as they are associated with the preservation of a presumably desirable state. Consequently it is unlikely that policy relevant PBs could be established without explicit consideration of human activities, aspirations and stewardship. While acknowledging the need for simple concepts and corresponding "actionable" metrics, PBs should be expressed as a balanced triangle whose vertices represent (i) planetary resources, (ii) ecosystem-based resources and (iii) societal needs, resources and aspirations.

The degree of human appropriation of abiotic planetary and biotic ecosystem-based resources offers a useful framework to define sustainability, once societal aspirations and technology are taken into account.Because these linkages can be influenced by decisions this approach is suited to support policymaking for sustainability. A significant intensification of human appropriation of water will be necessary to support anticipated basic services and wealth generation over the coming decades.

The calls for sustainable developments like the "Future We Want" UN GA resolution from the RIO+20 conference, fell short defining what sustainable living would look like. Hence defining sustainability and how does this relate to freshwater remains an issue to be explored.

The Millennium Development Goals (MDGs) to halve the number of people without access to safe drinking water and adequate sanitation by 2015 serve as the lowest limits for societal needs as of today. The revision of MDGs is currently underway intending to address the sustainability of further development. The following dimensions of water management are proposed to be considered by a dedicated „Water SDG":

- Continue the „WASH" Goals (water supply, sanitation and hygiene);
- Improve IWRM and cross-sectoral approaches to water management;
    - NEXUS (like water-energy-food security interconnections)
    - Transboundary basins/aquifers
    - Ecosystem services and health
- Increase resilience against global change impacts;
    - Management of the risk of hydrological extremes
    - Climate adaptive water strategies
- Improve waste water management: pollution reduction, re-use;
- Develop capacities: data, monitoring, assessment, education, research; Clearly achieving them can only be possible in a transdisciplinary, multiple stakeholder context. Selecting the indicators and setting the respective target values must respect scientific consensus based PBs for water. Hence an achievable „Water SDG" needs urgent science-based inputs.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Planetary boundary concepts are considered as part of sustainability research. While the original concepts focused overwhelmingly on natural sciences and resource availability, recent publications highlight the crucial role of societal aspirations, value systems and that of planetary stewardship. By linking the research field of planetary boundary assessments and indicator development with the ongoing and politically driven process of establishing the new set of SDGs the proposed research direction is offering fourfold integration potential: that of social and natural sciences, their common evolution from explorative towards policy relevant science and an integration across different scales of concern: global, national, municipal, down to household level. As fourth dimension the integration across sectors like land use (agriculture, food security), energy and water security (nexus dimension) can be mentioned. Thus the number of research groups which might be interested and able to contribute to the debate and research endeavors is quite large.

Several German reserach groups are involved in relevant research fields like PIK in climate change adaptation and planetary boundary concepts and global freshwater use modeling, UFZ and the Water Science Alliance, ISOE in integrated water resources management (IWRM) and related research, University of Osnabrück in water governance, the Global Water System Project in planetary boundary issues and contributing to indicator development for SDGs and beyond. CEDIM, University of Potsdam and GFZ in water related disaster risk research, CAWR (UFZ & TU Dresden) in IWRM in the context of global change including water quality management, recycling and closing the water cycles. In the area of land use PIK, Humboldt University and UFZ can be mentioned. (List is without the claim of completeness).

Short description about of the internationalization potential of the suggested theme idea:

Next to the expectedly wide interest from within the German research community the potential involvement of international research groups will emanate from the global scale approach and from the ongoing international involvement to formulate and set the SDGs.
Potential interest is expected from:

Stockholm Environmental Institute,
Stockholm Resilience Center,
Stockholm International Water Institute,
International Water Management Institute,
International Food Policy Institute,
Global Water Partnership,
UNESCO IHE, Delft
UNESCO International Hydrological Programme, Paris,
GEWEX of WCRP,
Environmental Crossroads Initiative of City University New York,
International Institute for Sustainable Development Winnipeg,
International Institute for Applied Systems Analysis,
United Nations University institute for Water and Environmental Health, Hamilton, Canada,
UN Water,
Friends of Water (Circle of UN Ambassadors in New York, being engaged in the intergovernmental process towards the SDGs and advocating a dedicated SDG for Water),
Independent Research Forum (www.irf2015.org)

and from many more universities, research institutes, professional/scientific associations and civil society organizations

Towards a sustainable management of atmospheric aerosol particles to minimize risks for humans, ecosystems, and economic systems

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Short presentation of the theme idea in the Future Earth context:

Atmospheric aerosol particles are a natural component of the atmosphere. They originate from two kinds of sources, i.e. (i) from direct sources such as sea salt, wind erosion from the terrestrial surfaces, emissions from vegetation or volcanoes, and (ii) from the formation of particles within the atmosphere from precursor gases from natural emissions, for example organic gas emissions from the vegetation, and from gases from anthropogenic activities such as sulfur dioxide or nitrogen oxides. Aerosol particles serve as condensation nuclei for the formation of clouds and therefore play an important role in the global hydrologic system. They also transport nutrients in the Earth system. For example, the phosphorous nutrition of the Amazon rain forest in South America depends on the transport of aerosol particles from the Sahara desert in Africa.

Atmospheric aerosols also play an important role in the radiation budget of the atmosphere. Their role in the climate system is important but among the least understood if it comes to climate change (see the Fifth Assessment Report of the IPCC, www.ipcc.ch).

Human activities contribute about 50 % of the atmospheric aerosol mass worldwide. Over the continents, particularly in urban air, the anthropogenic contribution may be as high as 90 % or more. Besides industries and power plants, many other processes such as street traffic, cooking, heating, agricultural activities, land use change, contribute to the atmospheric aerosol mass, directly or indirectly.

It is well accepted that the atmospheric aerosol particles exhibit a toxic potential to humans. They trigger respiratory and cardiovascular diseases. The smaller the physical size of aerosol particles, the larger their toxic potential. The impact on the society is enormous, not least in economic terms. European legislation sets limits to the maximum allowed mass concentration of aerosol particles (PM10 and PM2.5) in air. There is a disadvantageous discrepancy between the legislation that focusses on the particle mass concentration (PM) and therefore on the larger particles, and the rather new findings that it is the smaller particles, nano-particles, that cause health problems but do not contribute much to the particle mass.

New findings show that aerosol particles are also harmful to vegetation and ecosystems. Plant species likely have adapted to natural aerosol regimes by sculpturing their leaf surfaces, either to reduce particle accumulation ('Lotus effect'), or to capture aerosol borne nutrients, dependent on the environment. If deposited in abundance, particles reduce the resilience towards drought stress. Therefore, one of the adverse effects of climate change, the increased drought-induced mortality of trees, is even amplified by aerosol particles. This effect is very hard to observe because deposited aerosol particles tend to take up water, liquefy, and eventually remain undetected with conventional techniques.

In order to develop profound understanding of the adverse effects of aerosol particles, and in order to mitigate their harmful potential in future global societies and ecosystems, intense international and inter-disciplinary research and development of technology is required:

- medical science: epidemiological documentation and toxicological research
- ecosystem science: research on particle-plant interaction mechanisms and their physiological importance; development of suitable monitoring systems and thresholds to address the aerosol drought effect on plants
- urban meteorology: research on the role of vegetation in the urban climate, including the chemical micro-climates
- process engineering: further development of sustainable and widely useable particle filtration techniques for private use and small and medium-sized industries.
- agriculture: strategies to reduce emissions of particles and particle precursor gases
- social sciences: development of knowledge and awareness towards particle exposure as a dominant risk
- R&T: development of standards to quantify number concentrations of nano-particles, implementation of evaluation guidelines

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Over the past 10 years, research on atmospheric aerosol particles has been funded by the DFG in more than 20 German universities and research centers. Most research was in the field of meteorology and climate change, however, medical research, as well as technical, economic and social topics were treated as well. The interest of the German research community in the field of aerosol particles is huge.
Some aspects seem underrepresented:
The effects of aerosol particles on plants and entire ecosystems are not studied with the required emphasis. This lies in the difficulties in studying ecosystem-atmosphere exchange of particles on both the atmospheric and plant physiological sides, and on lacking knowledge on the impact processes. Effects on various scales are not known.
The atmospheric aerosol system as a driving fundamental mechanism in the past, present, and future societies has not been acknowledged and recognized well enough. The development of process understanding, and the improvement of the livability of macro- and micro-environments through particle management in various spatial and temporal scales, are key societal tasks of this century.

Short description about of the internationalization potential of the suggested theme idea:

Atmospheric particles as such are a topic of international importance. Photo documentation of air pollution in megacities of Asia is present in every day's news. Much progress has been achieved in Europe and North America over the past decades to improve air quality. However, for aerosol particles, there is no lower concentration limit, under which the toxic potential becomes zero. At present, there is uncertainness because further efforts to improve air quality should address nano-materials. In this field, however, no technical standards or quantifiable research results (as for particle mass) are available. A huge international research effort is needed to improve process understanding and the interaction with societal mechanisms.
The impact of aerosol particles in ecosystems and ecosystem services are not well studied. The actual presence of ecosystem research platforms such as TERENO provide opportunities to study ecosystem interaction with the atmospheric aerosol system. Process studies can be initialized there. In order to study ecosystem response in the context of climatic gradients (for example, drought gradients), experiments in various climate regions will be needed. The impact on global ecosystems will have to be quantified though implementation of novel processes in global atmospheric and ecosystem modelling activities.

An integrated policy framework for sustainable development

Dr. Hermann Lotze-Campen, Potsdam Institute for Climate Impact Research (PIK)

Short presentation of the theme idea in the Future Earth context:

Several international initiatives have emerged over the last years to conceptualize the boundary conditions under which sustainable human development may be accomplished in a constrained environment, ranging from local to global scales. Key examples are Planetary Boundaries or Climate-Smart Agriculture. These efforts either focus on the definition of limits to resource use or technological or institutional options to make human activities less resource-intensive.

Of course it is very important to know the biological and physical limits to human activity and resource use, e.g. of land, water, minerals, fossil fuels, or biodiversity. These have to be based on sound natural science research. It is also important to know major options for human society and individual actors to change behaviour and adapt to resource scarcity at different levels. Very often changes in demand for resource-intensive products or development of new technologies for resource-efficient production are mentioned. Options for behavioural, technological or institutional change have been studied in the social sciences for a large number of region- and sector-specific conditions.

However, the crucial link between specific resource constraints and adaptive behaviour of humans is an appropriate set of policy instruments and incentives. Specific policy instruments for specific resource management questions are available and well understood. Examples are property rights for land, pricing of water resources, emission-trading schemes for air pollutants and greenhouse gases, pollution taxes for chemicals, or public investment in emerging technologies. These policy instruments have two key functions: changing the behaviour of consumers in their purchasing decisions and, maybe more importantly, changing the investment behaviour of firms towards more resource efficient modes of production. By internalizing the external environmental effects of human actions, appropriate policy measures can steer human bevaviour in the direction of a more sustainable socio-economic development.

While many of these policy measures work relatively well for a specific problem, e.g. water pollution or land use or energy-related emissions, it is less clear how they interact, if several inter-linked problems have to be solved at the same time. For example, if greenhouse gas emissions would be effectively reduced by emission pricing in all sectors, this would most likely lead to an increased demand for ligno-cellulosic bioenergy, which would increase the demand for land. Increasing demand for land, especially in tropical forests, would lead to biodiversity loss and may also have negative effects in areas with scarce water resources. Various policy goals as part of a sustainable development agenda are likely to compete with each other and it is very hard to foresee their combined effects.

Hence, the key challenge and pre-condition for achieving sustainable socio-economic development, or sustainable co-evolution of human-environment systems, is an appropriate integrated policy framework, which takes the necessary interlinkages between different resource dimensions into account. This may be a combination of emission taxes, land-use regulation, water pricing, payments for various ecosystem services, abolishment of resource use subsidies, trade liberalisation and public investment in research and development and technology transfer.

In order to understand the linkages and interactions between these measures, model-based ex-ante assessments are crucial. These assessments have to be conducted at different scales in a process of continous stakeholder interaction and involvement. Only such an approach will assure that key trade-offs and synergies within an integrated policy framework for sustainable socio-economic development are well understood.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The development of an integrated policy framework for sustainable development remains a challenge at national and international levels. It requires links between different policy areas, e.g. environment, climate, energy, agriculture, trade, finance. This has implications for various international negotiations, e.g. UNFCCC or WTO. It also poses interesting challenges to scientific research, empirical modelling, and policy assessments. A wide range of inputs and contributions from natural sciences and social sciences are crucial. Policy instruments provide a direct link between environmental conditions and constraints on the one hand, and human behaviour and social change on the other.

However, joint interdisciplinary research that links qualitative formulations of policy targets and institutional settings with rigorous quantitative assessments of their impacts and interactions is still in an infant stage. This is also due to the fact that integrated assessment modelling of various sustainability questions, not just climate change, is only slowly evolving. An integrated policy framework for sustainable development in a globalizing world is also an appropriate topic to link assessments across scales, because regional case studies under specific conditions have to be embedded in more general global-scale analyses. Otherwise, far-reaching local impacts of resource scarcity in remote world regions cannot be well understood.

Short description about of the internationalization potential of the suggested theme idea:

Policies for sustainable development have to be designed and implemented at local, national and international scales. Through trade, finance, telecommunication, tourism and cultural exchange regions and nations are increasingly interlinked. Local action is embedded in global policy frameworks. The design, assessment and implementation of an integrated policy framework for sustainable development requires knowledge generation, information exchange, negotiation and cooperation across the globe. At the same time, each specific setting in a local or regional context requires a well-tailored analysis.

Through modern data management, communication and visualization tools, the results and knowledge generated from a large set of regional case studies can be easily combined with results from large-scale assessments and scenario exercises. The „global village“ or „global garden“ could become a reality, including the development of appropriate mechanisms for knowledge generation, institutional innovation, and resource management.

Nachhaltige geothermische Nutzung und Speicherung in urbanen Räumen

Philipp Blum und Kollegen

Kurze Darstellung des Themas im Future Earth Kontext:

Die nachhaltige geothermische Nutzung und Speicherung in urbanen Räumen hat ein enorm großes CO2-Einsparungspotential in Deutschland als auch weltweit. Mithilfe dieser Nutzung und Speicherung kann der Kälte- und Wärmebedarf in Städten zum Teil nachhaltig gedeckt werden.

Mehr Information zu diesem Thema und Idee finden Sie hier: http://www.3sat.de/page/?source=/nano/technik/154836/index.html

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Bereits heute arbeiten zahlreiche Forschungsgruppen an dem Thema der nachhaltigen geothermischen Nutzung und Speicherung in urbanen Räumen, wie z.B. KIT, UFZ, GFZ, TU Dresden und TU München. Das Thema passt hervorragend zum Themenfeld II „Global development".

Da die „Technologie" in dicht besiedelten Städten eingesetzt werden soll, müssen bei erfolgreichem Einsatz, viele Akteure miteingebunden werden. Es ist daher auch ein interdisziplinärer Ansatz erforderlich.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Wie in Deutschland arbeiten auch andere Forschungsgruppen aus Kanada, Niederlande, Japan und China mehr oder weniger an diesem Thema. Intensive Kontakte bestehen hier bereits. Nichtsdestotrotz wäre eine weitere Internationalisierung bei diesem Thema sehr wünschenswert, da die Anforderungen und Durchführung dieser „Technologie" sehr von länder- und stadtspezischen Bedingungen abhängt.

Für weitere Rückfragen stehe ich Ihnen gerne jederzeit zur Verfügung.

Philipp Blum

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Potentials of improving food security through closing yield gaps and land use expansion

Delzeit, R., Klepper, G. (Kiel Institute for the World Economy), Mauser, W., Zabel, F. (Ludwig-Maximilians University)

Short presentation of the theme idea in the Future Earth context:

With a world population that is expected to grow from currently about 6.9 billion to 9.2 billion by 2050, as well as changing lifestyles and consumption patterns towards more protein containing diets, the Food and Agricultural Organization (FAO) estimates that meeting the world's food demand requires a 70% increase in total agricultural production. Land productivity considerably increased over the last 6 decades, since in this period the food production was doubled while agricultural land only increased by 10%. However,agricultural yields as well as production stability is threatened by a changing climate. Meeting this challenge requires global and regional measures. They include changing diets, reducing food waste and losses, agricultural land expansion and increasing biomass production by agricultural intensification. While expansion of agricultural land into non-agricultural ecosystems is discussed critically, agricultural intensification is considered the most promising choice to increase production for meeting the increasing demand.

Food security is subject to the ability to produce a sufficient quantity and quality of food and also on the food price level. Future global food and biomass production potentials depend on the interplay of complex Earth system processes with human decisions. Thus, simulations of future food supply and prices are driven by various biophysical and socio-economic global and local parameters and assumptions.

This theme aims to create knowledge on the inter-linkages between global agricultural markets, availability of land for different uses, climate change, and land productivity.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

This research topic is of interest for different fields of research such as agricultural economics, biology, climate science, economics, geography, hydrology, social sciences,.

Short description about of the internationalization potential of the suggested theme idea:

The topic can be adressed from local to global perspectives and offers opportunities to investigate linkages between these different scales.
On the international agenda food security is a prominent topic with the potential to link up different research groups and initiatives. There is already a connection to the Global Land Project which could be intensified.

Interactions among Managed Ecosystems, Climate, and Societies (IMECS)

Almuth Arenth

Short presentation of the theme idea in the Future Earth context:

Land systems and Climate change: Climate change and land-use change are essential environmental challenges to society that are inseparably linked: the climate shapes the way people use land; land-use change contributes to global and regional climate change by affecting biogeochemical and biophysical processes. The interplay between land-use and climate change is fundamental in understanding land-based climate mitigation options and how societies will adapt to climate change. The climate, environmental and socio-economic research communities are confronted with providing understanding of the fundamental processes, and their manifold interactions across local, regional, and global scales. A key challenge is to find ways to bridge, philosophically and methodologically, between the diverse scientific communities. Finding ways to synthesise available data and knowledge will allow further development of the mechanisms represented in models, advance our capacity to evaluate model performance, and yield information to support policy development and societal adaptation.

Joining forces in Future Earth: The iLEAPS, GLP and AIMES community have proposed "Interactions among Managed Ecosystems, Climate, and Societies (IMECS)" as a new cross-cutting activity under the Future Earth umbrella. IMECS arises from a number of past workshops in 2011-13, including the IGBP Land-Use Synthesis meeting in Garmisch-Partenkirchen, Germany, the GLP workshop in Crackenback, Australia, an EMF workshop session in Snowmass, Colorado, and the first IMECS workshop in Amsterdam. These initial activities have been successful in bringing the different communities and disciplines together, exchange approaches and creating a mutual understanding of the challenges and knowledge gaps. The discussions, as reflected in a number of reports and papers indicated clearly that joint action of the different communities is needed. The knowledge gaps cannot be addressed by a single core project or within one research community, re-iterating the grand challenge for more interdisciplinarity in global change research identified during the process towards the establishment of Future Earth and now one of the core principles of the recently started Future Earth project.

Objective and main research questions: The objectives of IMECS are two-fold: 1) providing a platform for interaction and knowledge exchange for the different communities that study the coupled land and climate systems, including the identification of research priorities and agenda setting; and 2) providing synthesis of existing studies and initiate new research, both to increase understanding and provide support to designing sustainability solutions. The IMECS initiative is intended to be a long lasting initiative of collaboration between the different core projects, open to everyone that is willing to actively contribute to tackling these challenges and contribute to its activities. While clearly bridging between all three Future Earth Themes, it is most "at home" under Global Development.

IMECS addresses a core question of sustainable development: how can we use our land resources sustainably, given large-scale and rapid environmental changes (land use change, climate change) that go handin- had with growing population and changing lifestyles.

Example research questions for IMECS include:

- Which land-system change processes are of prime importance to climate assessments: what are the main uncertainties in view of imperfect land-use information, what is lost in translation?
- What alternative and innovative approaches are available for land-use classification and observation systems?
- How can we consider human decision making in view of multiple socio-economic pressures, land management options and interacting agents of decision making?
- How to represent land-based adaptation and mitigation regionally and globally, including teleconnections?
- How will land-based adaptation and mitigation affect the climate system?

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Developing from existing IGBP/IHDP core projects, IMECS already has a strong international engagement. Presently, IMECS is coled by a German scientist, and there are several very strong research groups –in the natural, social and economic sciences domains that will contribute to IMECS- at universities and research centres within Germany that can provide crucial input to the research as it will be developed over the coming years.

Short description about of the internationalization potential of the suggested theme idea:

Developing from existing IGBP/IHDP core projects, IMECS already has a strong international engagement. Presently, IMECS is coled by a German scientist, and there are several very strong research groups –in the natural, social and economic sciences domains that will contribute to IMECS- at universities and research centres within Germany that can provide crucial input to the research as it will be developed over the coming years.

Options for multifunctional landscapes in Sub-Saharan Africa - Searching realism while aiming for food security, resilience, climate mitigation and socio-economic development (MULTI-SSA)

Rüdiger Grote (Karlsruhe Institute of Technology), Achim Maas (Institute for Advanced Sustainability Studies, Potsdam), Marcus Kaplan and Michael Brüntrup (German Development Institute - Deutsches Institut für Entwicklungspolitik/DIE)

Short presentation of the theme idea in the Future Earth context:

Africa, and in particular Sub-Saharan Africa (SSA) has one of the largest growing populations worldwide and at the same time faces extended degradation of land, which is urgently needed to provide and protect local resources such as soils, food, fiber, energy, wildlife and water. Many locations face low nutrient content, high pressure of pests and diseases, and are exposed to erosion as well as extreme and variable weather conditions. Unsustainable management practices have led to the degradation of agricultural systems as well as other ecosystems and the services they provide. In addition, global environmental change will modify the boundary conditions for environmental, agricultural and socio-economic development. The capacity of smallholder farmers to modify these circumstances is limited.Although some variations within countries and across sub-regions exist, it can be generalized that economic, demographic, human capacities and governance factors shape the vulnerability of a large share of the African countries and their populations.

On the other hand, countries in SSA have a large agricultural potential in terms of underutilized land and yield gaps. Improved and sustainable agricultural and forestry management in combination with large-scale afforestation could support adaptation to climate change and would also contribute to mitigation through increasing carbon sequestration and changing regional climate towards lower temperatures and higher precipitation.

Despite a number of small-scale successes, pleas for large-scale management changes are met with reluctance for various reasons and face also strong organizational challenges. First, there are real and perceived competing political priorities leading to competition between different land-use options such as afforestation, biofuel- or food production. Second, any action would require a substantial amount of financial resources and expert support for implementation. Third, the scale needs to be large requiring the cooperation of African and Non-African countries. Therefore, the task can only be approached with a substantial back-up of scientific knowledge, financial support and political determination.

Integrated and interdisciplinary research on different levels in combination with a multi-faceted transdisciplinary strategy that concentrates on the most promising regions and management approaches could make a substantial contribution. Problems have to be analyzed and solutions have to be adapted to the diversity of ecologic, economic, social and political conditions:

- At the local level, land management practices should be developed (or existing ones should be scaled up after evaluation), which result in higher productivity and contribute to ecological sustainability, particularly considering conditions under future climate change. This involves multiple disciplines from both, natural and social science, addressing the spectrum from climatology, hydrology, and pedology to economic analysis, legal scholarship, social, ethical and political sciences. Furthermore, local knowledge on environmental processes and societal affairs will be critical to identify feasible strategies.
- At the regional and national level, integrated measures and strategies have to be proposed, which consider the multifunctionality of land and land use. As far as cross-country activities are concerned, policies must enhance regional cooperation and trade. From a trans-disciplinary angle, it is necessary to include stakeholders, decision makers and shapers from the beginning to create ownership, but also make data and knowledge available which may not be available otherwise.
- Finally, the role of international frameworks and guidelines has to be addressed. Possible trade-offs between benefits regarding global environmental goods (e.g. CBD or UNFCCC) and the well-being of people in rural SSA areas have to be avoided. The

impacts of official development assistance, either bilateral or multilateral, and the role of the private sector including regulations such as the Voluntary Guidelines on the Responsible Governance of Tenure (FAO) are further important aspects.

The suggested topic will support projects that are following this strategy. These will have to a) analyze local vulnerability, resource requirements, infrastructure and market access, b) concentrate on the multifunctionality of land-use strategies to achieve win-win situations, and c) explain benefits from local to (trans-)national scale, concentrating on successful examples. Any measures suggested within these fields are expected to increase carbon sequestration and thus are to be potentially supported by international funding, such as the Green Climate Fund. More issues or linkages to other topics (e.g. regarding renewable energy production) should be added depending on stakeholder-interactions.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The importance of African development with respect to natural science has been acknowledged in the BMBF directives to support Partnerships for Sustainable Solutions with Africa. Within this directive research on health, communication and environmental management is supported, strengthening the German Science community in this field. The current topic would sustain and intensify this research and tightening them to locally adapted and sustainable strategies (also outlined in the BMZ initiatives to strengthen food security, good governance, and rural development) as well as to global climate change research.

We see particular opportunities for contributions of German science institutes in the following fields of study:
1) Climate change research (e.g. Max-Planck-Institute for Meteorology, MPI-M/Hamburg; Potsdam Institute for Climate Impact Research, PIK/Potsdam)
2) Ecosystem development and environmental research in General (e.g. Karlsruhe Institute for Technology, KIT/Garmisch-Partenkirchen; Centre for Environmental Research, UFZ/Leipzig...),
3) Land-use and management, including bioenergy and food production (e.g. Kiel Earth Institute, KEI/ Kiel; DBFZ Halle, …)
4) Development studies (e.g. Center for Development Research, ZEF/Bonn; German Development Institute, DIE/Bonn; Institute for Development and Peace, INEF/Essen; United Nations University - Institute for Environment and Human Security, UNU-EHS/Bonn)
5) African studies and regional studies (e.g. German Institute for Global and Area Studies, GIGA/Hamburg; Centre for Interdisciplinary Africa Research/Frankfurt am Main; Cologne Africa Studies Centre/Cologne; Institute for Anthropology and African Studies, Mainz)
Furthermore numerous universities as well as private partners for decision support (e.g. UNIQUE Forestry and Land Use GmbH Freiburg) are potential contributors for to this topic.

Short description about of the internationalization potential of the suggested theme idea:

Given the focus on Africa, the strong focus on transdisciplinary research plus the possible global impacts on climate and other areas, such as food and (bio-)energy prices, the topic has a high level of internationalization. Specifically cooperation with African (e.g. African Academy of Sciences, Council for Scientific and Industrial Research, Centre of Excellence in Renewable Energy and Sustainable Development, etc.) and international (e.g. International Food Policy Research Institute, World Agroforestry Research Centre, International Livestock Research Institute, etc.) research organizations.

Beyond Germany and Africa, there are strong research communities on targeting Africa and climate change in France and the UK, as well as other European countries (e.g. Stockholm Environment Institute) and in North America.

The topic would be of high political relevance for African countries and the African Union as well as African regional organizations (e.g. SADC, ECOWAS, IGAD, ECCAS, etc.), while international organizations (e.g. FAO, UNEP, UNDP, World Bank, EuropeAid) and national donor organizations (e.g. GIZ, NORAD, SIDA, CIDA, USAID, DFID, AFD) as well as large NGOs (such as CARE International, Oxfam, World Vision, Brot für die Welt, etc.) operate programs related to land management and climate change in Africa.

Linking human well-being to ecosystem services and biodiversity changes: a social-ecological systems perspective

Marion Glaser, Diana Hummel, Hauke Reuter, Matthias Wolff

Short presentation of the theme idea in the Future Earth context:

Biodiversity change is one of the „Grand Challenges" of global sustainability research. As planetary level boundaries are being reached or passed, inter- and transdisciplinary approaches to research, knowledge building and transfer become increasingly necessary. These must integrate not only findings from the natural and the social sciences, but also relevant knowledge of ecosystem users, authorities, local communities and others. The factors affecting and the implications of biodiversity change in the terrestrial and marine realms for ecosystem services, livelihoods and human well-being are likely to differ but not well researched yet.

While work on terrestrial biodiversity seems comparatively well-developed with large programmes such as DIVERSITAS or the UNESCO Programme „Man and the Biosphere", the implications of marine biodiversity change are considerably less explored. In the global sustainability context, this is particularly pressing for tropical regions of the globe. Tropical seas and coasts are hotspots of biodiversity and tropical coasts are home to the great majority of humanity with the highest population densities on earth. To investigate the implications of marine biodiversity change in tropical regions is thus a crucial part of the solution-oriented global sustainability research envisaged in Future Earth. Changes in terrestrial biodiversity in the coastal zone are transported to the oceans via drainage basins, estuaries and deltas, impacting marine biodiversity. Research on these interlinked biodiversity dynamics and their implications for marine ecosystem services and associated human livelihoods and human well-being is needed.

Given the interdependencies between natural and societal processes at temporal, spatial and social scales, the social-ecological systems (SES) perspective provides a research framework for a problem-oriented approach to coastal biodiversity dynamics and its effects on ecosystem services, livelihoods and human well-being. Glaser et al. (2012) propose that „a social-ecological system consists of a bio-geo-physical unit and its associated social actors and institutions. Social-ecological systems are complex and adaptive and delimited by spatial or functional boundaries surrounding particular ecosystems and their problem context". Based on this, Hummel et al. (2011, in the Biodiversity and Climate Research Center (BiK-F) linked biodiversity and ecosystem services within an integrated SES framework. The SES concept can serve as a „boundary object" (Star & Griesemer 1989) for research on biodiversity change, ecosystem services and human well-being: It facilitates understanding of concept transfers and problem-oriented communication across disciplinary borders within science, as well as heterogeneous discourses between science and society. The proposed SES concept is flexibly structured so that it can be applied to different nature-society themes and aspects; it enables different research approaches and can be used at the case study level. Strong links to concepts from natural sciences are possible to facilitate analysis of drivers for biodiversity change and resource use trajectories.

This theme explores how to link natural science research on biodiversity change using a conceptual SES framework which is applicable for social-ecological case studies of terrestrial and marine systems.

The theme comprises three main parts: a) a joint discussion on the conceptual framework of SES linking terrestrial and marine biodiversity change, ecosystem services and human wellbeing, b) transdisciplinary case studies with an explicit focus on biodiversity related land-ocean interactions in the the coastal zone and their implications for humanity and society. Marine and terrestrial case studies would relate to each other and:

- describe processes and patterns of biodiversity change (e.g. biodiversity indices and regional distribution, changes in biodiversity and drivers of change; Thresholds for impacts on ecosystems functions and services; Resilience; Feedback processes between system productivity and structure and characteristics of resource use)
- identify points of leverage for safeguarding essential elements of biodiversity and ecosystem functions and related ecosystem services (including assessment of effects of different management approaches)
- identify biodiversity related stakeholders and their interests (who gains and who loses what?)
- include (the development of) processes to engage stakeholders in inclusive, problem identification and solutions-oriented visioning and knowledge transfer

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The Leibniz Center for Tropical Marine Ecology (ZMT) can be described as leading the field in Germany in terms of integrating natural and social science research on coastal and marine sustainability issues in tropical regions. ZMT is keen to expand current research on coastal and marine ecosystem services in ways which integrate regionally specific natural science data on biodiversity change with data on the implications of shifts in ecosystem services for the livelihoods and well-being of different coastal stakeholder groups.

ISOE - Institute for social-ecological research is one of the leading independent institutes in Germany engaged in sustainability research. Areas of research include water, energy, climate protection, biodiversity and population dynamics. ISOE follows a transdisciplinary research approach: Insights from the social and natural sciences are merged and experience and expertise of practice partners from society, politics and industry are integrated into the research. ISOE is partner of the Biodiversity and Climate Research Center (BiK-F) and responsible for the area „Social-ecological dimensions and knowledge transfer" and is particularly interested in increasing transdisciplinary biodiversity research.

Short description about of the internationalization potential of the suggested theme idea:

This theme is clearly part of global challenges and the field for internationalization is fertile.
GEC Projects like LOICZ and IMBER have the theme of coastal and marine biodiversity within their remit, the Global Land Project (GLP) covers terrestrial biodiversity, DIVERSITAS focuses on terrestrial but not marine or coastal biodiversity.
Based on CBD criteria, the Global Ocean Biodiversity Initiative (GOBI) (http://www.gobi.org) is undertaking a global effort to identify ecologically or biologically significant areas (EBSA) in the marine realm.
The Group on Earth System Observations (GEO BON) (http://www.earthobservations.org/geobon.shtml), has a Marine Ecosystem Change Working Group and eight further mainly or exclusively terrestrially oriented working groups.
The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) www.ipbes.ne with now 114 member nations aims to strengthen science and the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development. It aims to address terrestrial, marine and inland water biodiversity and ecosystem services and their interactions. With its conceptual development still under way, links will have to be explored.

Social Identity and Global Environmental Crises

Prof. Dr. Immo Fritsche & Dr. Philipp Jugert, Universität Leipzig, Institut für Psychologie

Short presentation of the theme idea in the Future Earth context:

Global environmental crises, such as climate change, are both outcomes and determinants of aggregated human behavior. It is the task of environmental psychology to understand the conditions under which people engage in sustainable or non-sustainable behavior and how to foster sustainable conduct. At the same time, it examines how global environmental crises affect human thinking, motivation and behavior.
However, most of the pertinent research still focusses on attributes of INDIVIDUALS and how these determine sustainable action (e.g., perceptions of personal self-efficacy) and how they are affected by crises (e.g., individual health). This broadly neglects the decisive role human COLLECTIVES play in relation to global environmental crises. These crises are always the outcome of aggregated, collective behaviors, such as pollution. At the same time they not only affect individuals but also collectives. Although collectives are of course made up by individuals, social psychological research shows that people think and act differently depending on whether they think of themselves as individual persons („I“) or as collectives („We“). The latter kind of We-thinking or „social identity“ is characterized by personal attitudes and needs loosing importance in favor of a „collective reality“. Thinking as members of collectives or groups, for instance, changes people‘s perceptions of what constitutes a threat. Whereas contemporary Europeans may conceive of climate change as constituting low risk when thinking in terms of their personal self, risk perception may dramatically change when they think in terms of „We“, thereby possibly including future generations or people in other parts of the world into their psychological self. Also, perceived crises have a distinct influence on collective thinking or social identity, as they may increase people‘s striving for social cohesion and ethnocentrism. To understand the distinctive role of collective thinking as both determinant and consequence of global environmental crises, and to gauge how behavior and system change efforts should address the collective level of the human mind, an extensive research programme on social identity and global environmental change is warranted.
Specifically, we suggest two different perspectives on how social identity is related to global change:
a) Social Identity Is Affecting Sustainable Action -- sample research question:
Collective efficacy perceptions as the missing key to understand the puzzle of sustainable action intentions: Previous research shows that although people‘s beliefs in personal efficacy predict their intention to engage in active coping with personal risk (such as reducing the risk of getting cancer), its predictive power is markedly lower for people‘s motivation to engage in pro-environmental action. This seems to be rooted in the very nature of global environmental crisis as a phenomenon which is not affected by an individuals‘ actions but critically depends on the actions of collectives. This suggests that instead of personal efficacy it is a sense of collective efficacy which may drive people‘s intention to act in a pro-environmental and sustainable manner. Interdisciplinary research should explore the psychological, social, political and economic conditions under which collective efficacy beliefs in societies develop and the way in which they affect individuals‘ actions towards environmental sustainability on various dimensions (e.g., consumption patterns or political decisions and preferences).
b) Global Environmental Crises Are Affecting Social Identity Processes -- sample research question:
The interplay of socio-structural conflict and motivated social cognition in determining security risks of climate change: Climate change can increase societies‘ propensity to conflict. Whereas in previous social and natural sciences research it has been speculated about the role of socio-structural determinants (e.g., resource conflict, migration waves), recent research in environmental psychology has found that climate change may even foster conflict via unconscious processes of motivated social cognition: Perceptions of climate change as a national risk have been shown to exaggerate general authoritarian tendencies in people (e.g., derogation of deviant groups and

migrants). These unconscious processes may catalyze the effects of climate induced socio-structural changes on intra-societal conflicts, leading to increased intolerance and inclination to aggress towards migrants or competing groups. Of interest for designing possible interventions, framing climate change as a global (vs. a national) threat seems to have the potential of mitigating dynamics of intergroup conflict, as shown for conflict attitudes of Israeli and Palestinian citizens. Also, reminding people of societal norms of sustainability has been shown to increase pro-environmental conduct under conditions of perceived threat. An intergrative and interdisciplinary research programme is needed to understand the interconnections between socio-structural and socio-psychological processes that make climate change a security risk.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Most of the current research on climate change and biodiversity is dominated by the natural sciences. However, as the current environmental crisis is human-made, it is essential that more efforts are made to understand how one can bring about behavioral change in individuals and collectives. It is unlikely that environmental crises can be combatted by technology alone. Social and environmental psychology are well-positioned to provide advice how to achieve behavioral change and it is time that this topic is granted more attention in current global efforts to mitigate climate change.

Considering social identity processes as a key determinant and consequence of global environmental crises is both a yet missing piece within environmental psychology as well as a key for understanding the interplay between human action on the personal and the collective level. That is, social identity research helps to link research on environmental crises within the social sciences (e.g., sociology, political sciences) with research in the behavioral sciences, such as psychology.

Over and above that, earth system research needs to more strongly integrate models of psychological functioning in the context of global environmental change to increase the precision of predictions concerning social system responses to global change.

Short description about of the internationalization potential of the suggested theme idea:

Social identity is an emerging field within environmental psychology and the psychology of environmental crises. Actually, our group is initiating first concerted exchange of and collaborations between research groups across the globe. For example, groups from the United States, Australia, The Netherlands, and Germany have indicated participation in an international conference symposium initiated by the authors of the present proposal. At present, the European Journal of Social Psychology has announced a special issue on social psychology and climate change, and social identity research on environmental crises, such as climate change, is increasingly published in the premier journals of the fields (e.g., social psychology, environmental psychology). These developments speak for a high international potential of social identity research in the environmental sciences.

Foresight and impact assessment – Methodological challenges of story and simulation approaches relevant to regional and local decision makers in a changing world

Jochen Schanze, Axel Sauer, Marco Neubert, Rico Vogel, Gerard Hutter

Short presentation of the theme idea in the Future Earth context:

Methods of foresight and impact assessment are commonly used to explore the dynamic planet. However, up to now there is a methodological chaos particularly regarding the science-policy interface and the resulting uptake of knowledge on possible future system's change with uncertainties involved. Against this background, the contribution identifies key methodological challenges of story and simulation approaches (e.g. Alcamo 2008, Schanze et al. 2012) that aim at linking policy making with scientific evidence. Starting point are three dimensions of strategic planning of decision makers: content, context and process (Hutter & Schanze 2008). While the content dimension refers to the cause-effect interrelations e.g. of human-environmental systems, the context dimension highlights the conditions of decision makers and the process dimension reflects the way of strategising and learning. Under the process dimension according to Wildavsky (1988), anticipation and resilience can be differentiated. A typical means of anticipation is foresight and impact assessment. Three key steps may be indicated to accomplish story and simulation approaches: First, the conceptualisation and operationalisation of the system is referred to combining qualitative scoping and quantitative system's simulation with coupled modelling. Second, assumptions are addressed for qualitative and quantitative scenarios on autonomous change and strategic alternatives on targeted system's interventions as well as their combination to so-called futures. Third, evaluation of these futures is regarded to through covering the adjustment of goals and targets, the system simulation ex ante with the coupled models, and the evaluation itself with the suitability of evaluation concepts such as robustness of strategic alternatives under different scenarios.

For each step, state-to-date examples are presented from national and international climate change impact assessment and adaptation studies on local and regional scale. Examples range from (i) holistic conceptualisation of the climate sensitive human-environment system with coupled modelling of key processes and (ii) consistent regional change projections involving climate model ensembles and societal change projections to (iii) impact assessment and evaluation ex ante considering uncertainty bandwidths. Based upon, a number of key methodological challenges are derived for future research. This covers the diversity of spatial and temporal resolutions of the impact models and the propagation of uncertainties. Moreover, limitations of regional societal change projections are identified with focus on knowledge gaps referring to the influence of key drivers on land-use change.

The issues of foresight and impact assessment according to the strategic planning view are then embedded in the frame of a societal process of strategy formulation and implementation as story and simulation approach. On the one hand, specific formats for stakeholder involvement are presented that provide the science-policy interface for each step of the foresight and impact assessment. On the other hand, tailor-made decision support are stressed as an important role for reduction of complexity and knowledge transfer why an example is presented on how to facilitate the use of comprehensive information from foresight and impact assessment in interactive and user-friendly webbased spatial decision support tools. Hereby, foresight and impact assessment are translated in geoinformatics technologies using UML modelling (e.g. Vogel et al. 2014).

Once the scientific evidence is accessible, there still remains the question of how to understand and specify the general expectation of a science-policy interface with regard to the choice of an appropriate project design to apply methods of foresight and impact assessment (Van de Ven 2007). From extensive empirical work and field studies it can be concluded that projects with the aim of applying methods of foresight and impact assessment should also be related to local and regional governance processes (e. g. Healey 2007, Hutter 2013). Beyond, there is the challenge of producing relevant results for local and regional decision makers, for instance, in terms of "salience", "credibility" and "legitimacy" (Cash et al. 2002). Therefore, the notion of methodological challenges finally includes the challenge of "knowledge co-production" by science and practice.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Natural science scenario exercises on future cause-effect interrelations and social science studies on societal processes of scenario planning are still two mainly independent fields. This leads to a situation where foresight and impact assessment do not contribute to policy making in the required way especially as far as the regional and local development under global change conditions is concerned. This contribution aims at fostering the link between scientific evidence on possible futures with their impacts and the conditions of decision making practice. Not at least two round table workshops of the DFG Commission of Water Research (KOWA) confirmed the high potential of this thematic area regarding target-oriented advancements of the available methods. A key requirement in this respect seems to be the trans-disciplinary view on the societal decision-making instead of the still predominant expectation of a transfer of scientific knowledge to the decision makers. Hence, the proposed research is envisaged to bridge the gap between modelling and strategy formulation and implementation. Accordingly, it will attract scientists from natural and social science as well as decision makers responsible for future developments such as climate change impact assessment and adaptation.

Short description about of the internationalization potential of the suggested theme idea:

Although the contribution addresses the regional and local level, it has a strong international relevance. On the one hand, it includes the multi-level issue of global change and regional or local response. On the other hand, it provides the prerequisites for a comparison and specification of regional and local issues worldwide under the view of common methodological challenges. Therefore, it may be seen as a valuable task complementing the research on global foresight and impact assessment as it is being carried out by the IPCC, UNEP and others by more process-oriented approaches for regional and local decision makers.

Towards a sustainable use of ocean resources: making the most of marine aquaculture

Lena Göthlich

Short presentation of the theme idea in the Future Earth context:

The oceans are both a seemingly inexhaustible source of resources and an apparently endless sink for refuses. In these contrasting capacities, the oceans are on the one hand underused, in that humans still use only a very small proportion of the oceans' highly diverse biotic and abiotic resources. On the other hand, the oceans are overstrained: fish, as one of their most heavily used biotic resources, is overfished to a large extent and many stocks have already collapsed. An answer to this problem lies in marine aquaculture.

Present-day aquaculture commonly consists of a single species of carnivorous fish and relies heavily on fish meal as a feedstock. The fishes' wastes lead to local pollution and eutrophication, thus overstraining the oceans' sink function. The high demand for fish meal leads to overfishing of smaller fish. However, in the light of limited fertile land for agriculture and a globally growing demand for food and specifically animal protein, the importance of fish and other seafood in human consumption is growing and will continue to do so. Aquaculture is increasingly necessary to supply these needs.

The corresponding challenge lies in making aquaculture sustainable. Instead of focusing on a single species and maximising the production of biomass, aquaculture should be implemented in ways that allow for a diversity-based approach. Culture conditions can be transformed from high-density monocultures to stable multitrophic systems that, instead of producing high-nutrient wastes, produce cleaner water than they require as input. Besides the usual carnivorous fish, aquaculture can include the entire food chain: Almost everything from primary producers, i.e. micro- and macroalgae, via primary consumers such as zooplankton to finally fish or shrimps can be used. Even the resulting wastes can be applied as fertiliser for aquaculture or agriculture. Besides the more obvious uses of biomass like food, feed or dietary supplements, there are various other possibilities in using marine organisms. Algae, for example, can take up CO2-rich exhaust gases and thereby sequester CO2; they serve as food, feed and dietary supplements, produce colourants and other additives; and those species whose biomass is high in lipids can be used for the production of biofuels that are exempt from the food-vs-fuel debate surrounding land-use conflicts. To grow, algae need (sea-)water, light, CO2 and nutrients, which can in turn be obtained from fish aquaculture wastes.

However, the potential of culturing marine organisms other than fish, particularly in mixed culture systems, is far from being fully explored or even understood. The questions arising in this context fall into various disciplines, such as ecology and theoretical ecology, plant and animal physiology, ethology, coastal zone management, economics and business economics, engineering and cultural science: Which species to culture, under which conditions and in what combinations? How to implement multi-trophic aquaculture and keep it stable? Where are conflicts in land/coastal zone use and how can they be addressed? How to minimise the energy needed to run the system? How to reduce freshwater and nutrient input and output ? How to extract valuable substances? Where is the financial break-even point and how can it be reached? How high is the system's maintenance and stability? What is the region's history with regard to aquaculture? What does the traditional regional aquaculture look like and what can be learned from it?

These and related questions need to be addressed when assessing future nutritive and energy demands. The amount of people living in coastal zones is increasing, an consequently also the pressure on the coasts and the nearshore ocean. To balance this pressure with the growing need for food and energy, an integrated concept for sustainable aquaculture is crucial.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany as a coastal nation has a long history of using the ocean for food sources. With the currently overfished stocks of many commercially used fish in the North and Baltic Seas, aquaculture is an attractive alternative to produce sea food. However, the coastal regions are mostly agricultural land and eutrophication is already an issue. Thus closed-circuit systems that recirculate the nutrients or multi-trophic systems that clear the water with the help of algae should be in the focus of research. Several German research institutes are already conducting research in that field.

Furthermore, the coastal regions are comparatively structurally weak and would hence welcome new ways to generate local income and job opportunities on a long-term basis. Implementing sustainable aquaculture in a way that ensures economic and ecological benefits and in accordance with the local population and governments requires close collaboration between biologists, engineers, business economists, economists and social scientists. In addition, the dialogue with the public and the local stakeholders is important to achieve broad acceptance of the respective planned system.

Short description about of the internationalization potential of the suggested theme idea:

Seafood from marine aquaculture is a potential sustainable food source particularly in countries that lack fertile soil or other means to produce sufficient animal protein. However, to be sustainable, marine aquaculture requires access to seawater, since artificial seawater is too expensive. Hence in coastal regions, multitrophic aquaculture is a promising alternative food source with the potential to clear water of excess nutrients.

Besides fish, particularly algae are a valuable food source, since they contain all essential amino acids and are high in vitamins and essential fatty acids. Their nutritional value is far superior to that of e.g. corn and can counteract malnutrition in developing countries. Since not all algae require sea water, algae aquaculture is not restricted to the coasts, but, like all aquaculture, requires sufficient water. An advantage of many developing countries with respect to growing algae is high solar irradiance, particularly in comparison with Germany. High light intensities in combination with the ability to grow algae outdoors year-round allow for high biomass productivity and corresponding low production costs. Furthermore, in some regions (e.g. Mexico and East Africa), algae have been harvested for centuries, and the extensive existing knowledge could be used to improve algae use in other regions.

Generally, there is a high demand for alternative food sources and sustainable aquaculture can meet part of that demand. International collaboration, particularly with researchers and stakeholders in developing countries, is quintessential to succeeding in making sustainable aquaculture globally feasible.

Traversing the oceans-climate change governance divide in addressing climate change impacts on the marine environment

Anna-Maria Hubert (Institute for Advanced Sustainability Studies, Potsdam)

Short presentation of the theme idea in the Future Earth context:

The global ocean is at the front lines of climate change. The ocean - through its absorptive and buffering capacities - has largely been responsible for ameliorating the effects of accelerating post-industrial carbon dioxide emissions on land. However, these benefits have come at a cost, particularly from the 'deadly trio' of ocean acidification, warming, and deoxygenation. Although the effects of rising atmospheric carbon dioxide emissions on the oceans are not fully understood, impacts on coastal and oceanic ecosystems are already being observed. Marine scientists warn that continuing along this path could result in a fundamental state change in marine conditions with severe consequences over the coming decades for all life in the oceans and the human communities they support. The consequences could be devastating, particularly given that the oceans are already experiencing widespread impacts due to other anthropogenic pressures such as overfishing, resource extraction, intensified shipping, marine pollution, and bioprospecting, to list but a few.

More marine research is vital, for example, to understand the dynamic interactions and synergistic impacts of multiple climate stressors acting simultaneously on particular areas of the oceans. Yet, research on the growing expanse between our knowledge of climate impacts on the oceans and our ability to respond with improved global governance is even more urgently required. While natural scientists understand the climate and oceans functioning as an integrated, complex system, the international legal regimes and institutions governing the sea and atmosphere, respectively, are fragmented, exhibit governance gaps and too often operate in an uncoordinated fashion. For example, from a international legal perspective, carbon dioxide emissions and thermal energy from the greenhouse effect fall within the legal definition of marine pollution. However, regime interaction between international climate law and the law of the sea is complex, and the lack of effective standards in the UNFCCC and related legal instruments to control greenhouse gas emissions are a bottleneck for addressing climate impacts on the marine environment. Furthermore, despite the central role of the oceans in the climate system and their importance to the welfare of human societies, the world's oceans receive only peripheral attention in international climate negotiations and politics, in which the focus remains on terrestrial-atmospheric interactions. In addition, a burgeoning area of interest for addressing some of the adverse effects of climate change, particularly in light of perceived policy failures regarding the stabilization of emissions, is the idea to actively leverage natural processes by geoengineering the environment to offset some of the adverse effects of climate change. However, many of these schemes remain untested and the benefits unproven and such ‚solutions' could pose serious risks to the marine ecosystems. In particular, solar geoengineering could present an indirect risks to the marine environment in the context of the ‚moral hazard' problem, since such methods only target temperature increases as one aspect the climate problem, and do not address the cause of climate change (i.e., rising carbon dioxide emissions) which is also the cause ocean acidification.

Reducing global greenhouse gas emissions must be an international imperative to avoid serious and irreversible changes to marine ecosystems from climate change. Yet reaching this aim requires new approaches and integrated global governance across spacial and temporal scales and sectors to cope with the transformation of ocean systems. Decision-makers at all levels and in different geographic regions will also have to take into account information about existing anthropogenic stressors on marine ecosystems in addressing the climate threat. A starting point for traversing the oceans-climate change divide could be to facilitate a deliberative dialogue between natural and social scientists, government, business and civil society to identify the reasons for why marine impacts are not adequately represented in the framing of the

climate problem and to determine how the oceans could figure more prominently in the development of future climate policy and emissions targets. From here, researchers could develop policy strategies for improving the architecture and responsiveness of global governance in this area and enhance accountability and transparency.

The problem of climate impacts on the marine environment is also a paradigm for Earth system governance in the Anthropocene, in general. In-depth study of relevant institutions, organizations, and governance mechanisms could yield insights for addressing other governance challenges arising from human-induced changes to the global environment.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany invests heavily in basic and applied research related to matters of global sustainability, and funds several world-class research institutions which are recognized as global leaders in marine scientific research and climate change science. Germany is well-positioned to convert its international expertise to traverse the oceans-climate change divide by providing policy-relevant information, e.g., regarding the adverse on climate change on the marine ecosystems, as well as social science expertise and transdisciplinary knowledge on how humans can regulate their relationship with the natural environment in the context of sustainable development. Germany has also shown leadership at the international level in addressing climate change issues, e.g., most recently by pledging funds at the COP19 of the UNFCCC for the Adaptation Fund and as a global leader in progressing towards Energiewende (or ‚energy transition'). Germany, as a coastal state and maritime power, will also be impacted by the severe and potentially irreversible changes caused by rising greenhouse gases on the oceans and thus has in interest in fostering improved ocean and climate management. Thus, constituents of German community are key stakeholders who can play an important leadership role in devising governance solutions for traversing the oceans-climate change governance gap.

Short description about of the internationalization potential of the suggested theme idea:

It is a prerequisite for success that research on oceans-climate change issues is international in scope in order to yield meaningful results in terms of providing effective global governance solutions. A main reason for this is that matters related to the protection of the marine environment can straddle geographical boundaries (e.g., exclusive economic zone and high seas areas) and sectors, and involve interdependent ecological processes. In a similar vein, given that all local emissions contribute to changes in global atmospheric chemistry, the international community has recognized in the preamble to the UNFCCC that the problem of global climate change is the ‚common concern of humankind'. International cooperation is therefore necessary in order to gather all necessary information, to share the burden of addressing the issue of climate-related impacts on the oceans, and to enhance buy-in and legitimacy for new governance proposals. Another reason why research on this topic should have an international dimension is that greenhouse warming and rising carbon dioxide emissions will impact marine ecosystems differently in terms of effects on different regions (e.g., polar oceans), marine habitats (e.g., coral reefs, mangroves) and marine species (e.g., calcifying organisms). Information on all of these local and regional impacts, including socio-economic consequences, will need to be monitored in order to compile a global picture of the scope of the problem. Furthermore, it is predicted that developing states will likely be more adversely impacted from the impacts of climate change on the oceans and therefore the input of stakeholders from these affected regions is absolutely necessary in crafting equitable governance responses taking into account ‚common but differentiated responsibilities'.

Vergleichende Fallstudien zu lokalen Transformationsprozessen mit Relevanz für Klimaschutz und Klimaanpassung

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Kurze Darstellung des Themas im Future Earth Kontext:

Klimaschutz- und Klimaanpassungsbemühungen auf der nationalen und internationalen Ebene kommen nur langsam voran. Auf der lokalen Ebene existieren allerdings eine Vielzahl transformativ angelegter und dynamischer Klimaschutz- und Klimaanpassungsinitiativen, z.B. die Transition Town- und die Resilient Cities-Bewegung, Initiativen für lokale Energieversorgung, die Klimaallianz sowie einige Bürgerinitiativen für Naturgefahrenvorsorge und Klimaanpassung. Über ihre zunehmende Vernetzung und die Verbreitung von sogenannten Good-Practice-Beispielen vor allem über das Internet kommt diesen lokalen Initiativen auch ein Transformationspotenzial über die jeweilige Stadt oder Gemeinde hinaus zu. Unklar ist aber, welches die entscheidenden Auslöser, aufrechterhaltenden Bedingungen und wirksamen Faktoren für den Erfolg dieser lokalen Transformationsinitiativen sind.

Systematisch vergleichende Fallstudien in einer Vielzahl unterschiedlicher Städte und Gemeinden, in denen klimawandelbezogene Transformationsprozesses stattgefunden haben oder noch stattfinden, würden eine wertvolle Grundlage für die Theorie- und Methodenentwicklung der noch jungen Transformationsforschung darstellen. Nur eine derartige systematisch vergleichende Fallstudienforschung, in der dieselben Fragestellungen mit vergleichbaren Methoden in unterschiedlichen lokalen Fallstudien bearbeitet werden, erlaubt es, generalisierbare von fallspezifischen Einflussfaktoren transformativer Prozesse zu trennen.

Systematisch vergleichende Fallstudien zu lokalen Transformationsprozessen mit Relevanz für Klimaschutz und Klimaanpassung könnten einen wichtigen Beitrag dazu leisten, das Ziel des „Theme 3: Transformation towards Sustainability" zu erreichen. Sämtliche Aspekte dieses Ziels könnten mit Fokus auf die lokale Skala adressiert werden:

- „Understanding transformation processes and options", z.B.: Verlaufen Transformationsprozesse auf der lokalen Ebene vor allem top-down oder bottom-up? Wie stark klaffen die in der Wissenschaft priorisierten Klimaschutz- oder Klimaanpassungsoptionen und die von lokalen Akteuren favorisierten Optionen auseinander und warum?

- „assessing how these relate to human values and behaviour, emerging technologies and social and economic development pathways", z.B.: Welche Faktoren sind entscheidend dafür, dass sich Menschen - BürgerInnen und lokale Entscheidungsträger - in lokalen Klimaschutz- oder Klimaanpassungsinitiativen engagieren? Welche „Diffusionskanäle" auf der lokalen Ebene sind entscheidend für die lokale Verbreitung neuer Klimaschutz- oder Klimaanpassungstechnologien?

- „evaluating strategies for governing and managing the global environment across sectors and scales", z.B.: Welche Prozesse zur inter-sektoralen Koordination und multi-level Governance sind besonders erfolgreich? Welche Treibhausgasminderung (Klimaschutz) bzw. Schadenminderung (Klimaanpassung) kann durch lokale Initiativen erreicht werden? Welches Transformationspotenzial haben die lokalen Klimaschutz- bzw. Klimaanpassungsinitiativen für andere Städte und Gemeinden oder auch für andere Entscheidungsebenen, z.B. durch ihre attraktive und inspirierende Verbreitung über das Internet?

Systematisch vergleichende Fallstudien zu lokalen Transformationsprozessen könnten zudem eine Lücke in der klimawandelbezogenen Forschung schließen, in der systematisch vergleichende Fallstudien in einer Vielzahl unterschiedlicher Städte und Gemeinden bisher fehlen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Systematisch vergleichende lokale Fallstudien zu Transformationsprozessen mit Relevanz für den Klimaschutz und die Klimaanpassung können an bestehende interdisziplinäre Forschungszweige in der deutschen Forschungslandschaft anschließen.

Für den Klimaschutz ist dies unter anderem die sozial-ökologische Forschung (SÖF), die sich in der Vergangenheit mit sozial-ökologisch relevanten Prozessen insbesondere auch auf der lokalen Skalenebene beschäftigt hat. Auch für die Zukunft ist dies vorgesehen, wie in dem SÖF-Memorandum „Verstehen - Bewerten - Gestalten. Transdisziplinäres Wissen für eine nachhaltige Gesellschaft“ (2012) zum Ausdruck kommt, welches von führenden Akteuren der transdisziplinären Nachhaltigkeitsforschung vorgelegt und von über 1000 Personen unterzeichnet wurde. In diesem Memorandum wird die „Transformation urbaner Räume“ als eines der für die neue Förderperiode der SÖF besonders förderungswürdigen Themenfelder genannt. Auch an den BMBF-Förderschwerpunkt „Forschung für die nachhaltige Entwicklung der Megastädte von morgen", der auf die Thematik „Energie- und klimaeffiziente Strukturen in urbanen Wachstumszentren" fokussiert, kann im Klimaschutzbereich sehr gut angeschlossen werden.

Für die Klimaanpassung kann zum einen auf die Erfahrungen, Ergebnisse und inter- und transdisziplinären Netzwerke der KLIMZUG-Verbundprojekte aufgebaut werden, die zwar jeweils einen mehrere Städte und Gemeinden einschließenden regionalen Bezug hatten, aber auch die Wichtigkeit der lokalen Ebene und lokaler Akteure für Klimaanpassungsprozesse zeigten. Zum anderen kann hier auf die Expertise und das Interesse von international tätigen deutschen Forscherinnen und Forschern zu Vulnerabilität und Vulnerabilitätsreduktion, Resilienz und Resilienzerhöhung sowie Naturgefahren und Naturgefahrenvorsorge aufgebaut werden.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Ein kürzlich für den JPI Climate Call eingereichtes Proposal, das vergleichende Fallstudien zu lokalen Transformationsprozessen mit Relevanz für Klimaschutz und Klimaanpassung als Kernidee beinhaltet, hat gezeigt, dass für diese Idee eine hohe Teilnahmebereitschaft bei europäischen Forschungspartnerinnen und -partnern besteht. Aus dem weit überwiegenden Anteil europäischer Staaten, die sich an diesem Call beteiligt haben, konnten innerhalb kurzer Zeit hochkarätige Forschungspartnerinnen und -partner für das Proposal gewonnen werden.

Auch international scheint bei Forscherinnen und Forschern ein Interesse an einer systematischen Vergleichsforschung zu lokalen Klimaschutz- und Klimaanpassungsprozessen zu bestehen. So ist beispielsweise bei einigen IPCC-Autorinnen und -Autoren, die den jeweils aktuellen Forschungstand zum Klimawandel zusammenfassen, eine gewisse Frustration zu spüren, dass sie aufgrund mangelnder vergleichender Fallstudienforschung in den meisten Fällen nicht beschreiben können, welche Fallstudienergebnisse wahrscheinlich generalisierbar und welche eher fallspezifisch sind. So bleibt die Übertragbarkeit von Fallstudienergebnisse auf andere Kontexte oft unklar und Entscheidungsträgerinnen und Entscheidungsträger, die die IPCC-Berichte lesen, können beispielsweise nicht ersehen, ob ein Klimaschutz- oder Klimaanpassungsvorgehen, welches sich in einer bestimmten Region als wirksam erwiesen hat, auch in ihrer Region voraussichtlich wirksam sein wird.

Sustainable Multilateralism: International Cooperation towards Sustainable Global Development

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Short presentation of the theme idea in the Future Earth context:

The global ecological crisis that constitutes Future Earth's very raison d'être is also the expression of a fundamental crisis of international cooperation and multilateral policy, especially at the nexus of environmental governance and socio-economic development. Indeed, ongoing megatrends that are driving profound changes in the earth system, the global economy and world society are bound to change the framework conditions for international relations. Yet, it remains uncertain whether and to what extent this will translate into fundamental changes in the patterns of international cooperation. With multilateralism in crisis it appears that international institutions - from the universal UN Framework Convention on Climate Change to the more exclusive „Group of 20" - seem incapable to overcome the structural barriers that stand in the way of effective collective action and an efficient provision of global public goods. Widespread consensus on this state of affairs is met with scant knowledge on how to adequately advance and accelerate international cooperation while normative projections of a reformed global governance architecture are routinely discarded as naive and utopian.

This calls for new analytical approaches that build on existing international relations theories, yet transcend them heuristically to meet the requirements of „transformation research" (WBGU 2011). Research in that vein will need to further our analytical understanding of the specific determinants and causal relationships of international cooperation against an ontological background that helps to identify ways to revitalize global multilateralism in a manner that is conducive to a global transformation towards sustainability. Established international relations approaches hence merely provide a conceptual basis that will need to be complemented inter alia by conceptual and analytical insights from global economics, historical institutionalism, organizational psychology as well as by methodologies that facilitate the analysis of complex long-term policy challenges. Such exploration of different theoretical avenues for understanding dynamic changes in multilateral cooperation are not supposed to lead to a new grand theory. Yet, it is expected to help identify specific drivers that are underlying transformative change in a global governance context and across multiple policy arenas, levels, and modes of multilateral cooperation. Identification of key drivers in turn can help to focus attention on points of leverage for actually reforming the multilateral system in a manner that is commensurate to the sustainability challenges identified by the natural and earth system sciences.

The underlying premise is that in a world of states multilateral cooperation remains indispensible to address the global ecological and governance crises in a manner that can be both effective and legitimate. Yet, the business as usual mode of multilateralism is insufficient to achieve this and is thus ultimately unsustainable. A transformed mode of multilateral cooperation will instead qualify as sustainable, if it adequately prioritizes the solution of global crises over geopolitical brinkmanship and thereby not merely revitalizes existing international regimes, but redefines the institutional structures and procedures of global governance for a post-sovereign world altogether.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The proposal draws on the work of a multi-disciplinary cross-departmental Task Force on the Transformation of International Cooperation at the German Development Institute/Deutsches Institut für Entwicklungspolitik and also relates itself to the German Advisory Council on Global Change's call for applied research on the prospects of a „revolution in international cooperation" (WBGU 2011) and the corresponding societal challenges identified in the European Commission's „Horizon 2020" research programme (EC 2013). It furthermore relates to the research agenda of the interdisciplinary Käthe Hamburger Centre for Global Cooperation Research, which investigates the possibilities and limits of cooperative behavior in human civilization. Hence, while the proposal is taking international relations and political science as a vantage point, it is deliberately open to a host of disciplinary and theoretical approaches and, indeed, considers this openness a requirement for heuristic progress on its subject matter.

Short description about of the internationalization potential of the suggested theme idea:

The international scope of the proposal should be obvious given its grounding in international relations and global governance research. Indeed, German scholarship has long been at the forefront of international scholarly theorizing on cooperation and conflict in international relations, notably through the analysis of multilateral environmental regimes. This proposal broadly sees itself in that tradition and should thus easily liaise with likeminded researchers in the EU and OECD. Moreover, given the centrality of the established North-South dichotomy to the current crisis of multilateral cooperation as well as the fundamental relevance of the ‚global South' for the transformative dynamics that are empirically evident, there is considerable potential for outreach to research communities in emerging economies and even developing countries.

The Sustainable Water Future Programme – Towards a Scientific, Policy Relevant, and Solution Oriented Global Water Research Program

Claudia Pahl-Wostl, Charles Vörösmarty, Anik Bhaduri, Janos Bogardi
Presenter-Anik Bhaduri, Executive Officer, GWSP

Short presentation of the theme idea in the Future Earth context:

The workshop will address the establishment of a "Sustainable Water Future Programme" (SWFP), evolving from the Global Water System Project (GWSP), which was launched in 2003 as a Joint Project by the Earth System Science Partnership and its four Global Environmental Change programmes on which Future Earth is built. The GWSP conference "Water in the Anthropocene" held in Bonn, May 2013 set the stage for the next step in the evolution of the global water research agenda: As an output from this international event, the water community established a set of core recommendations in the form of "The Bonn Declaration on Global Water Security". The declaration calls for joint global action to develop a broad community consensus blueprint for a reality-based, multi-perspective and multi-scale knowledge-to-action water agenda based on these recommendations.

The concept note for the establishment of the SWFP is conceived based on the recommendations of the Bonn Water Declaration, with a clear objective of promoting the adoption of science-based evidence into the formulation, implementation and monitoring of goals for sustainable development (which we believe is needed irrespective of whether or not a stand-alone goal for water will become part of the SDGs).

Over a decade of global water research has provided clear evidence on the global dimension of the water challenge, as well as the role of humans as a chief force shaping the global water cycle. While previous research has emphasized the identification of problems more than the identification of solutions, a clear shift in emphasis towards solution-oriented approaches is required. The next decade of research must motivate a transition towards developing knowledge-to-concrete-action, finding solutions in the spirit of co-production and co-application of knowledge. A future solution-oriented synthesis and assessment process under the leadership of the scientific community within the framework of the SWFP offers a high legitimacy, with the aim of facilitating a knowledge flow between science, policy and application. The SWFP will be organized under three major thematic areas that resonate with a more solution and action-oriented approach.

1. Global State of Water

This theme will produce knowledge concerning the global state of water, developing conceptual and methodological innovations to improve analysis and diagnostic capabilities. It supports the monitoring of progress towards achieving global targets such as the Sustainable Development Goals. The programme will involve efforts to integrate and strengthen the fragmented landscape of global assessments through partnership with e.g.the World Water Development Reports and reports by the Group on Earth Observation.

2. Governing the Transition

This theme concerns the dynamic society-nature interface and interactions at and across different scales in terms of governing the transition towards a sustainable water future. The importance of governance reform, adaptive management, learning and negotiation processes will be reflected through a strong emphasis on policy relevant action research towards solution-oriented approaches.

3. Water as Global Change Agent

This theme focuses on the role of water as an agent of change towards sustainability. In particular, it will explore the water, energy and food security nexus, the water-carbon link and interfaces with water and health, as well as water and biodiversity issues. It will highlight the role of water as an agent transmitting global change effects and its critical role in the development agenda, approaching change towards sustainability from an integrated water perspective.

Without successfully integrated models effectively bridging the science-policy divide, it is difficult to envision how highly interconnected and rapidly changing 21st century water systems can be sustainably managed. With an improved quantitative, geospatial, and institutional analysis depicting the biophysical and human dimensions of freshwater, the rapidly expanding knowledge base can be productively applied at scales important to managers, integrating it with situated knowledge and experience on the ground to produce robust solutions to complex problems. Close exchange between research, policymaking and practice will increase the practical relevance of knowledge produced within the SWFP.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

We envisage the German community to be heavily involved in any effort to establish such a Programme on global water research. Water is and remains an important interdisciplinary research area, centrally positioned at the interface of social and natural sciences, given that neither water governance problems nor technical issues can be successfully addressed without accounting for value systems, social aspirations, beliefs and culture.
Therefore, we explicitly encourage an integrated, interdisciplinary approach for the Programme and invite the German water community to actively join the discussion and contribute in shaping the Sustainable Water Future Programme.

Short description about of the internationalization potential of the suggested theme idea:

The Program will involve key International organizations working under the three thematic areas of the Sustainable Water Future Programme (the list of organizations is not yet comprehensive):

International Association of Hydrological Sciences (IAHS); International Association of Hydrogeology (IAH); International Union of Geophysics and Geodesy (IUGG); Integrated Global Observing System-Water (IGWCO); Global Earth Observation System of Systems (GEOSS); World Bank (Groundwater Advisory Team); World Climate Research Programme (WCRP), FUTURE EARTH; Potsdam Institute for Climate Impact Research (PIK) ; University of Kassel; Griffith University; The University of Hong Kong; National Institute of Hydrology, Roorkee, India; University of the Philippines Los Banos, Laguna, Philippines; Centro de Cambio Global Pontificia Universidad Catolica de Chile, Santiago de Chile, Chile; Stockholm Resilience Centre; Pacific Institute, United Nation University (EHS, FLORES and INWEH); United National Environmental Programme; Institute for Environmental Systems Research- University of Osnabrueck, Germany; and City University of New York - Environmental Cross Roads Initiative, Oregon State University; University of Amsterdam; TU Delft; Australian National University; University of Stellenbosch, South Africa; International Union of Conservation Networks (IUCN); Conservation International; The Nature Conservancy (TNC); Helmholtz Center for Environmental Research (UFZ); International Water Management Institute (IWMI); International Food Policy Research Institute (IFPRI); and Center for Development Research (ZEF) ;International Institute of Applied Systems Analysis (IIASA); UNESCO Institute for Hydrological Education (UNESCO IHE); The Research Institute forWater Security (RIWS)-Wuhan University; Swiss Federal Institute for Aquatic Science and Technology;

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Ko-Produktion von Wissenschaft und Politik in Future Earth

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Kurze Darstellung des Themas im Future Earth Kontext:

Dieser Themenvorschlag geht davon, dass das anspruchsvolle Konzept des co-designs und der co-production, das Future Earth auszeichnet, mit tiefgreifenden Veränderungen des Verhältnisses von Wissenschaft und Politik einher geht. Future Earth wird eine transformative Aufgabe zugeschrieben (siehe auch Debatte zu ‚transformativer Wissenschaft' in Deutschland, u.a. WBGU: Welt im Wandel). Es ist aber noch unklar, wie die neue Rolle der Wissenschaft in der Gesellschaft und der entsprechende neue „Gesellschaftsvertrag" konkret aussehen kann. Programmatisch findet sich dazu die Formel von „co-design und co-production". Wie können diese Konzepte konkret verstanden und vor allem in die Praxis umgesetzt werden? Future Earth stellt hier selbst ein Experiment der Transformation dar, das auf eine Neugestaltung der Grundstrukturen moderner Gesellschaften zielt: auf das Verhältnis von Wissenschaft und Politik und ihr Zusammenspiel in der Gestaltung kollektiver Ordnung.

a) Neuerfindung von Wissenschaft: Betrachtet man die Herausforderungen, die mit der Governance von globalen Problemen verbunden, wird deutlich, dass diese sowohl quer zu der theoretisch-methodischen und institutionellen Organisation von Forschung in Disziplinen als auch zu nationalen und regionalen Wissenskulturen und den in verschiedenen Formen institutionalisierten Wissenschaftssystemen liegen. Darüber hinaus wird Öffnung und Responsivität gegenüber gesellschaftlichen Belangen sowie die Interaktion mit politischen Gestaltungsakteuren zu einem der zentralen Kriterien für die Bewertung von Forschung. Damit verbunden stellt sich die Frage, mit welchen Verfahren und welchen Strukturen diese Herausforderungen adressiert werden können und müssen. Wie wird „Gesellschaft" repräsentiert und welche Akteure repräsentieren sie und verfügen über Kapazitäten zur Gestaltung? Hier verweisen laufende Prozesse zur Neuerfindung der Wissenschaft auf laufende Prozesse zur Neuerfindung der Politik.
b) Neuerfindung von Politik: Es werden auch neue Modi zur kollektiven Willensartikulation und Verfahren zur Generierung legitimer Entscheidung und Gestaltung notwendig, um globale Probleme zu adressieren. Globale Nachhaltigkeitsgovernance bezieht sich auf eine diversifizierte Weltgesellschaft jenseits nationalstaatlicher Kulturen, Öffentlichkeit, und etablierter politischer Verfahren. „Die Gesellschaft" zeigt sich hier als dichtes Netzwerk internationaler Organisationen und themenspezifischer Regime, sowie privater und zivilgesellschaftlicher Initiativen. Die Artikulation und Berücksichtigung des Willens schwach organisierter Gruppen und zukünftiger Generationen sowie der kulturellen und physischen Bedingungen gesellschaftlicher Entwicklung ist eine zentrale Herausforderung. Hier verweisen laufende Prozesse zur Neuerfindung der Politik wiederum auf laufende Prozesse zur Neuerfindung von Wissenschaft.
Es geht also praktisch darum, Wissenschaft und Politik gemeinsam neu zu erfinden. Hier stellt der Prozess, in dem Ko-Produktion im Rahmen von Future Earth ausgestaltet und umgesetzt wird, den ‚kernel' einer sich entwickelnden Governance von Transformationen zur Nachhaltigkeit dar.

Konkrete Forschungsthemen und Leitfragen:
(1) Was gibt's... an konzeptionellem und empirischem Wissen über Ko-Produktion?
Aufarbeitung eines Repertoires bestehenden Wissens zu Ko-Produktion und Bereitstellung für den laufenden Prozess: Wie kann „co-design" und „co-production" ausgestaltet sein? Das umfasst sowohl konzeptionelles Wissen (aus dem Bereich science-policy interaction, Politikberatung, Wissenschafts- und Technikforschung, partizipative und transdisziplinäre Forschung) wie auch empirisches Wissen (z.B. zu Formen der Ko-Produktion in nationalen Programmen der Nachhaltigkeitsforschung, im IPCC, im IPBES, Im MEA etc.)
(2) Wie läuft's... in der praktischen Ausgestaltung und Umsetzung von Future Earth?
Begleitende Untersuchung von Future Earth als Realexperiment zur konkreten Ausgestaltung und Umsetzung von Ko-Produktion: Die Analyse fokussiert auf die konkreten Interaktionen verschiedener Akteure und die Dynamik dieser Prozesse, insbesondere in Bezug darauf, wie verschiedene

Visionen, Perspektiven und Interessen zum Tragen kommen und mit einander verhandelt werden, zum Verhältnis von Wissenschaft und Politik, aber auch z.B. auch zum Verhältnis Natur- und Sozialwissenschaften und entsprechenden Formen der Governance und Repräsentation (wie Zentralität und Dezentralität, Standardisierung und Diversität, Stabilität und Dynamik).
(3) Wohin... führt das, zu welchen Dynamiken, Formen und Ergebnissen, wie lässt sich der Prozess gestalten?

Reflektion des laufenden Prozesses gemeinsam mit den beteiligten Akteuren: Die wissenschaftliche Beobachtung des Prozesses wird selbst als Ko-Produktion angelegt, z.B. in Form von Sitzungen zur kollaborativen Reflektion erhobener Daten und daraus abgeleiteter Beobachtungen, zur Diskussion von Zukunftsszenarien oder zur Exploration von Gestaltungsalternativen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Der Themenvorschlag stellt das Verhältnis von Wissenschaft und Politik in sich wandelnden wissenschaftlichen und politischen Kontexten in den Vordergrund, besonders in Bezug auf eine steigende Nachfrage nach politisch relevantem bzw. transformativem Wissen und in Bezug auf Globalisierungsprozesse wie Future Earth.
1. Es werden theoretische Konzepte für und empirische Formen von co-design und co-production in der Praxis untersucht,
2. Es werden soziale, politische und kulturelle Voraussetzungen, Auswirkungen und Entwicklungsalternativen der globalen Forschungsprogramme untersucht und in nationale und regionale Diskurse und Politiken zu Nachhaltigkeitsforschung und -transformation eingebettet (Down to Earth).

Relevanz für folgende Forschungsgebiete: Wissenschafts- und Technikforschung, Nachhaltigkeitsforschung/ Global Governance, Expertise, Politikberatung, Soziologie der Moderne
Anknüpfungspunkte in Fachvereinigungen: Dt. Vereinigung für Politikwissenschaft „Politik, Wissenschaft und Technik", „Umweltpolitik/Global Change"; Dt. Gesellschaft für Soziologie/ Sektion „Ökologie und Soziologie", „Wissenschaft- und Technikforschung"; Deutsche Gesellschaft für Wissenschafts- und Technikforschung;
Netzwerke & Kooperationspartner: Wissenschaftsforschung: z.B. Peter Wehling, Michael Guggenheim, Peter Weingart, Rudolf Stichweh; Sozialwissenschaftliche Klimaforschung, z.B. Cordula Kropp, Stefan Böschen, Martin Voss, Thomas Pfister; Sozialökologische Forschung, z.B. Thomas Jahn, Matthias Bergmann
Anknüpfung an Forschungsprogramme: EU science in society; BMBF Förderinitiative „Neue Governance der Wissenschaft - Forschung zum Verhältnis von Wissenschaft, Politik und Gesellschaft"; FONA/ Sozial-ökologische Forschung
‚Praxispartner': Programmkoordination und Projekte Future Earth sowie z.B. FONA/sozial-ökologsiche Forschung und andere Programme EU/international; Zivilgesellschaftliche Plattform „Forschungswende"

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Thematische Bezüge zu/ Kooperationen mit Forschungsarbeiten in folgenden Kontexten:
- International Social Science Council (ISSR): World Social Science Report "Changing Global Environments"
- Earth System Governance (ESG)
- Sustainability Transitions Research Network (STRN)
- Science & Democracy Network (Harvard University)
- JPI Climate Change: "Societal Transformation in the Face of Climate Change"
- ESF "Responses to Environmental and Societal Challenges for our Unstable Earth" (RESCUE) follow up
- COST Action „Climate policy innovation"

Der Themenvorschlag baut auf diesen Forschungsprogrammen auf, vertieft einen spezifischen Aspekt (Koproduktion von Wissenschaft und Politik in unterschiedlichen Kontexten unter konzeptionellen und empirischen Gesichtspunkten) und speist die Ergebnisse der Fallstudie in diese Initiativen (insb. Future Earth) zurück.

The role of the new Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in shaping transdisciplinary exchange between knowledge holders and decision-makers on different levels - A research, action and learning approach

Lisa Marquard, Carsten Neßhöver, Katja Heubach, Christoph Görg (Helmholtz-Zentrum für Umweltforschung, UFZ) ; Katrin Vohland & Malte Timpte (Museum für Naturkunde Berlin)

Short presentation of the theme idea in the Future Earth context:

In a transdisciplinary setting that Future Earth intends to build and support with its programme, it is essential that the research foreseen focusses not only on the global challenges themselves and their relationships to human activities and human well-being. Part of the research undertaken, should deal with the current global processes addressing these challenges on the level of decision-making and to make research more policy relevant for a tranisition to sustainable development. Research on these processes can contribute to Future Earth Theme 3 „Transition".
In this context, science-policy-interfaces (SPIs, or in a broader sense: knowledge-society-interfaces) play an increasing role. On the policy side, they react to the continuous plea, that decision-making should be „science-based" or „evidence-based", on the science side they try to embed and address the increasing wealth of scientific and other forms of knowledge that are potentially relevant for sound and knowledge-based decision-making.

On all levels the number of SPIs increases continuously, thus making these interfaces themselves, their characteristics and performance topics for research activities. Considerable insights have already been gained with regard to how such SPIs work more efficient, under which circumstances they are likely to fail and which attributes are crucial to their success.. Such findings are already partly taken into consideration for the advancement of existing SPIs or the design of new ones. For example, the essential attributes „credibility, relevance and legitimacy", brought forward as the ‚crele'-concept for research on SPIs, are now used for describing the desired qualities of present SPIs. One of the most prominent examples is the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) whose founding principles incorporated the 'crele'-framework.
IPBES is the latest SPI foundation on the international level with very high ambitions and a broad scope. It is directly addressing many major topics of Future Earth Theme 2 „Global Development". No other similar body or process on the global scale before has set higher goals for being inclusive with regard to all forms of knowledge relevant for its work as well as all relevant stakeholders. IPBES not only aims at producing (scientific) assessments, but also at supporting capacity building, at providing policy tools and methodologies, and at facilitating the generation of additional knowledge needed for its work. IPBES also aims to be an evolving platform and will therefore have to develop evaluation processes and tools to assess if they reach the ambitious targets.
However, the first two IPBES plenaries (IPBES-1, Bonn, January 2013; IPBES-2, Antalya, December 2013) have shown how difficult it is to bring all these diverse aspects into a sound work progamme and a coherent governance structure with rules and procedures that balance diverging interests of political control and open and broad stakeholder engagement.
This proposal aims at using the development process of IPBES as a showcase to gain further insights into such intergovernmental platforms, how they work and what they can achieve, and how they can best be implemented in a given setting, including the United Nations system and its rules and procedures, underlying the negotiations and activities of IPBES. At its second plenary, IPBES adopted its first work programme and the first assessments of IPBES will start in early 2014. These assessments could be the main subjects of research, using the 'crele'-framework and its foundation in science-studies as a conceptual framework.
In addition to that, and following a transdisciplinary approach the research carried out on IPBES would not be separated entirely from an involvement into the IPBES-process itself. Rather, it would include elements of „action and learning" supporting involved (and interviewed) experts' learning and understanding of the process and providing means and inspiration to reflect it critically. In order

to increase input and uptake of such ‚action and learning activities' by potential stakeholder, it is crucial to involve them already in the design of the research project. For example, one meaningful entry point could be the 'stakeholder engagement strategy' being developed in the intersessional phase between IPBES-1 and IPBES-2, but has not been adopted by IPBES yet due to severe debates around the term 'stakeholders' which finally led to a lack of time for a proper decision as well as other priorities (i.e. e.g. the IPBES programme of work). Thus, it is not clear yet how stakeholders will be involved in the elaboration of IPBES products like scoping papers and assessments reports. As a starting hypothesis we would argue that the further development of stakeholder participation in IPBES is decisive for the implementation and further development of the IPBES work programme.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

IPBES has created high interest in the German community during the last two years since its foundation, and will continue to do so – especially now as the first work-programme for 2014-2018 has been adopted. Numerous scientists might get involved into the IPBES- assessment processes, and thus would be potential addressees for this project, particularly with regard to the „action and learning" side of the project.

At the first and second IPBES plenary, several German researchers where present to observe and investigate the latest developments, showing the high interest for IPBES as an object of research.

Nonetheless, it will be important for the project not only to involve social scientists and science-policy-interface experts for conducting the research, but also natural science experts to work on the specific topics, where the processes of IPBES are investigated in depth.

Short description about of the internationalization potential of the suggested theme idea:

As the proposal focuses on a global body with the intention to work on different scales, the potential to make this an international project is high. Also, a number of science-policy experts in different countries can be expected to be interested in this project (e.g., from the U.S., Denmark, the Netherlands and the U.K.).

Well designed and properly communicated, such a project might indeed support the further development of IPBES towards on open and transparent platform by informing its processes and support its capacity building on science-society interface processes and potential evaluation tools.

A Global Water Ethics Charter as a Science-Policy process for global sustainability

Rafael Ziegler, Head of Research GETIDOS, deputy professor for environmental ethics, University of Greifswald; David Groenfeldt, Director Water-Culture Institute, Adjunct Professor Anthropology, University of New Mexico

Short presentation of the theme idea in the Future Earth context:

Background: The development of water resources in both the industrialized countries and in the so-called developing countries supplanted indigenous water infrastructure (e.g. traditional irrigation networks) and the local institutions by which that infrastructure was designed, constructed. Counter narratives of ecologically-based water development articulated by environmental groups and Indigenous Peoples have been easily marginalized by the dominant political and economic powers, who were invested in the conventional engineering paradigm. However, the emergence of ecological sciences coupled with advances in institutional analysis and an emphasis on water governance, have led to a new but still incomplete consensus that the paradigm of „command-and-control" engineering of natural water ecosystems is fundamentally flawed. Not only long-term sustainability but also medium-term resilience of artificially re-constructed rivers has proven elusive.

This proposal focuses on the emergence of a new global water culture and ethics (as exemplified by inter alia the human right to water, Integrated Water Resource Management and in Europe the Water Framework Directive). As sustainable management of water and water ecosystems co-depends upon explicit, deliberate, and widely-shared values and ethics this gradual evolution towards environmental sustainability ought to be highlighted and further studied with a view to its contribution to global sustainability. In fact, we propose that there is some urgency to such an investigation. As results from both the natural and social sciences tells us, there are strong present and likely future countervailing forces with a view to this evolution. For example, climate change leads to changes to water cycles and water distribution patterns as well as to increased investments in water infrastructure - dams, levees, pipelines, etc. - to enhance supply, rather than limiting water demand. In addition population and economic growth lead to increased consumption, including of meat, and thus to great demand for agricultural areas, putting further pressure on water and ecosystems. In short, increased stress on already degraded water ecosystem services is to be expected, and difficult conflicts between climate, water and food objectives have to be dealt with.

Research Proposal: Developing and promoting a "Water Ethics Charter" as part of a scientific-political process to „lock-in" the gains of progressive water policies, to set an explicit standard for sustainable water policies and to link the formulation and operationalization of such standards iteratively to the unfolding knowledge about aquatic ecosystems, the climate and social-ecological process more generally. Research tasks include:

1. Documentation and analysis of how „charters" [concise statements of principle] have been used to guide collective behavior in the context of religion, businesses, civil society organizations, municipalities, and other groups and organizations. What is the „value added" of a charter compared to rules, laws, and policies?
2. Synthesis of platform for a global water ethics based on already existing policy documents relating to water directly (e.g., Resolution on the Human Right to Water) and indirectly (e.g., statements on „Harmony with Nature" and the 2007 Declaration on the Rights of Indigenous Peoples).
3. Role of these values in modeling and scenario processes in hydrology and more general sustainability processes. How can models and scenarios incorporate alternative values?
4. Analysis of knowledge regarding the potential and limits of steering water governance in the presence of path-dependencies, exponential growth dynamics, interdependencies and uncertainty. What instruments and approaches linked to this ethics are already in place for a global water ethics? How well do they include/respond to the most recent natural and social science knowledge? What are the major barriers and obstacles of implementing widely agreed on objectives („implementation knowledge")?
5. What possibilities do digital media offer for a global water ethics charter as a process? What could be the material form of a charter today? „Values" are critical to the Future Earth agenda. A focus on water may both synthesize and thereby strengthen knowledge in the water sector, and serve as an exemplar for related domains of natural resources. The experience in Europe with the Water Framework Directive here may be particularly helpful.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The study of water management and a global water ethics requires inputs from diverse disciplines, ranging from law and philosophy to economics, psychology, anthropology to the hydrology, geology etc. of river basins and (aquatic) ecosystems. Related, already existing research examples include: 1) the study of value changes at the individual and societal levels, and how processes of values change can be accelerated, 2) research on the link between values and innovations processes (for example innovations for saving and recycling water as in aquifer storage and recovery processes, and the knowledge and technology required for such processes geologists, hydrologists, legal experts and remote sensing experts), and 3) social-ecological research on value-based steering processes drawing on the best available knowledges.

This is one type of integration. A second kind of integration is through the diverse stakeholders: local people, corporations, government policy makers and municipalities/cities. This moves the proposed project from an interdisciplinary to the trans-disciplinary focus of sustainability science. Groups already interested or involved in the idea of a Water Ethics Charter as a science-policy process include: UNESCO, the Alliance for Water Stewardship (representing major environmental groups - WWF and The Nature Conservancy-- plus major corporations through the CEO Water Mandate and also through the European Water Partnership), the international Water Youth Network (http://www.wateryouthnetwork.org/) and the Club of Rome.

With a view to the Future Earth proposals already send around before Christmas, this proposal is linked to the study of values that humans assign to their environments and the identification of planetary boundaries (Proposal Gerten et al. DP111, Proposal Bogardi et al GD 314). The proposal could feed into the modeling of planetary boundaries, with comparison of alternative assumptions about value systems and consequent behaviors and environmental impacts. In addition, cooperation is envisaged/believed to be fruitful with TS207 (Pahl-Wostl et al.) and GD310 (Tockner et al). A joint session or deeper collaboration with these researchers at the meeting and beyond could be beneficial.

Short description about of the internationalization potential of the suggested theme idea:

Research on a global water ethic as a science-policy process should be international from the beginning. As stated above, various parties have already expressed their interest for such a water ethics charter.

We see many examples for further developing this proposal with a view to further research strands. To give just one example: the idea of thinking of the Water Ethics Charter as a science-policy processes could be fruitfully linked to the Manifesto Project of Professor Leach/STEPS Centre in the UK.

In terms of the other proposals circulated, the research around global planetary boundaries and the evaluative and descriptive questions is raises is an example for the international potential of the proposal.

Adapting forests to future climates: Bridging the gap of climate change research and implementation

Lars Opgenoorth, Katrin Heer, Birgit Ziegenhagen, Sascha Liepelt, Alwin Janssen

Short presentation of the theme idea in the Future Earth context:

Landuse systems will have to adapt in the light of global climate change. A lot of research has been carried out on all different spatial scales and different land use systems in the past 30 years. However, specific mitigation strategies are still not visible in most contexts. Forests cover nearly 40% of Europe and around 23% of emerged land worldwide. Further, most „hot spots" of biological diversity where biodiversity is both high and vulnerable are actually forests. Thus, forests are highly important for biodiversity sustainability and in addition, provide numerous ecosystem services, including carbon sequestration and freshwater availability.
Impacts of climate and land-use changes on forests are expected to be acute. Environmental tipping points may be reached where tree populations collapse suddenly with irreversible effects on ecosystem functioning. Adaptive potential could nonetheless be high in tree populations: besides tracking their ecological niche spatially through migration, tree populations could adapt to the ongoing climate change in the short-term through individual phenotypic plasticity, and/or in the long term through evolutionary response to climate-induced selection. However, observed and predicted rates of climate and environmental changes are much faster than natural oscillations in the past. As a consequence, the question arises whether adaptation of tree species can keep pace with climate change.

In large areas, forests are managed intensively. As a consequence, forestry strongly influences the way forests are able to adapt to future climatic condition. One approach to adapt forests for future climates is assisted migration where individuals of a given species are translocated within or even outside of their natural range. A second approach – called assisted gene flow - uses the existing intraspecific genetic varibality along a species' distribution range to choose the best adapted genotypes from within a species.
However, both approaches are controversial for a number of reasons. First, they might counteract local adaptation to non-climatic environmental factors and cause maladaptation. Second, tree species as foundation species are involved in numerous interactions and interdependencies with other species that might be disrupted.

Instead of changing the gene pool, an alternative approach could target epigenetic adaptation. For example, it is already known that modification of epigenetic memory during embryogensis depends on environmental conditions. This approach craves lesser human intervention in the adaptational process, would protect local adaptation, and still give the chance to target specific traits.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Forest managment is a crucial aspect from an economic, societal and ecological point of view due to the key role of forest ecosystems for the maintenance of biodiversity and as providers of ecosystem services. Natural as well as managed forests will be confronted with changing climatic conditions in the future, and thus, we need to carefully evaluate the potentials and risks of any interference in forest ecosystems.

Germany with its long tradition in forest research has excellent prerequesites regarding experimental plots, common garden experiments, and progeny and clone tests to implement contrasting studies on epigenetics, assisted migration, and assisted gene flow. Furthermore, the current biocoenosis research trends in Germany target species interactions in interdependencies between foundation species and associated species. Thus, it enables a focused look into effects of assisted migration and gene-flow. Finally, while GMO approaches, and to a lesser extent assistent migration are highly controversial in Europe and especially Germany - the acceptance of epigenetic as well as assisted gene-flow are most likely very much larger. To evaluate the acceptence of such measures, socioecological studies are needed.

Short description about of the internationalization potential of the suggested theme idea:

Forest ecosystems are subjected to changing climatic conditions world wide and research groups around the globe are engaged in similar projects with different species. More importantly, distribution ranges of forest trees are usually on a continental scale. Understanding range wide adaptational potential is crucial for future climate change mitigation scenarios both in terms of research as well for implementation.

New Sustainability Pathways in Ocean Governance

Katherine Houghton, Sebastian Unger
(Institute for Advanced Sustainability Studies, Potsdam)

Short presentation of the theme idea in the Future Earth context:

Since time immemorial, humanity has treated the ocean as if it were inexhaustible. Now we know that the "blue wealth" of our planet is at risk and that our existing ocean governance structures are inadequate for meeting the challenges of sustainability in the Anthropocene. Three major challenges can be identified for ocean governance that warrant attention within Future Earth: (1) the growing pressure on the marine ecosystem, (2) the need to strengthen the overall governance structure for the ocean and (3) the connectivity with other compartments of the Earth system such as the atmosphere and soil.

Increasing knowledge of the magnitude of human impacts on the marine environment has intensified calls for tranformations towards sustainability in ocean management. Decades of outstanding scientific research in a variety of disciplines have brought us to this critical juncture, yet an overarching understanding of sustainability for different temporal and spatial scales remains challenging. Transdisciplinary research and co-development of knowledge have not yet played a significant role in ocean governance and represent a new way forward for actively engaging societies in articulating sustainability targets and designing overarching transformation processes. Due to the complex interdependencies between the Earth system and human activities, close collaboration between the natural and social sciences, as well as the participation of a much broader group of ocean stakeholders must be accomplished. This is particularly the case in the high seas, which are at the frontiers of science and are barely perceivable to most of the world's population.

One key issue that could be examined within Future Earth is how to achieve the alignment of different governance levels, usage issues and spatial domains to promote sustainable development in the ocean. It is already well-understood that ocean governance requires coordinated activities at the local, regional and global levels, yet institutional fragmentation and regime complexity hinder the institutional dynamics necessary for transformation. There is an urgent need to strengthen mechanisms for coordination and cooperation across ecological scales and governance levels, which ultimately requires fundamental shifts in human interactions with the marine environment.

An integrated approach to ocean governance must be developed which brings scientists, policy-makers and civil society together in a participatory and transparent manner. For example, a new legal instrument under the United Nations Convention on the Law of the Sea currently under discussion could aid in establishing a legal framework at the global level to better structure the necessary implementation pathways at multiple levels for sustainable development of the oceans. Such an instrument, however, requires a significant and holistic evolution of our approach to governance and lawmaking to foster sustainable Earth systems. At the same time, we must ensure that the science-policy interface continues to evolve as we engage with large-scale Earth system interactions and interconnections such as those between the ocean, atmosphere and soils. Another central element of discussion should concern how we can design ocean governance strategies which are able to dynamically respond to emerging challenges posed by new forms of ocean use such as climate engineering, alongside the compounding pressures of climate change, ocean acidification, pollution and biodiversity loss. Future Earth provides a unique forum to foster transdisciplinary approches to issues facing the ocean.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Governance approaches allow transdisciplinary dialogue between the natural and social sciences, as well as other stakeholders, and help ensure that the strengths of the different actors are integrated into a holistic process. Accordingly, Future Earth should prioritize the use of a governance lens for examining sustainability issues in the oceans. The German community is ideally positioned to engage in transformative governance research and policy-making to foster the sustainability of the ocean. Interested and committed actors exist across the science-policy spectrum, ranging from world-class centers for ocean research, marine-related social sciences and transdisciplinary institutes, working groups designed to bridge the science-policy gap, as well as policy-makers themselves. At the same time, Germany has critical national interests in the maritime industry, marine scientific research as well as conservation which require it to take a leading role in fostering sustainable approaches to ocean management.

Given this capacity and sense of responsibility within Germany, structuring an interface process for ocean governance is already likely to be a priority within the community. The initial challenge will be one of institutional design, which will require considerable discussion across the spectrum of actors and stakeholders.

Short description about of the internationalization potential of the suggested theme idea:

The oceans are emerging as one of the central arenas for the pursuit of sustainable develpment and figure increasingly prominently on the international political agenda. Since the 2012 United Nations Conference on Sustainable Development (‚Rio+20'), two potential pathways toward sustainability for the oceans have emerged at the international level which could provide starting points for oceans-related work within Future Earth. The first -- international efforts toward conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction (ABNJ) -- signals a critical juncture in international science and policy efforts to design effective governance mechanisms for a global commons across scales and sectors. The second -- the proposed Sustainable Development Goals (SDGs) -- offers a unique opportunity to frame the issues of the oceans in a manner that fosters international collective action toward sustainable development by enabling the involvement of a broad range of societal actors. Initiatives such as the UN Oceans Compact and Global Partnership for Oceans are just two examples of key policy processes already underway at the international level to support such efforts.

These emerging transformation processes provide tangible opportunities for international cooperation and collaboration between research institutions, representatives of transnational civil society and the private sector. Nonetheless, societal transformation processes must be underpinned with a solid scientific knowledge base which requires much broader involvement of the research community. In order to design effective pathways toward sustainability, it is increasingly accepted that both scientific and policy must reach beyond traditional approaches and be systematically co-created in order to ensure that they are mutually reinforcing transformative elements. Given the inherently global nature of the ocean, this topic provides an ideal context within Future Earth to explore the parameters of sustainability governance.

Ethics in the Research for Sustainable Development

Meisch, Simon Dr. / Potthast, Thomas Prof. Dr.

Short presentation of the theme idea in the Future Earth context:

The "Future Earth" programme was formed against the background of threats to ecosystems and an overall non-sustainable development. It aims for a new form of integration of economy and society in order to be able to make contributions to sustainable development (SD) in a global perspective. Thus, Future Earth is embedded in evaluative and normative contexts: science takes sides with respect to SD, but must not become biased and unscientific! "Ethics in the Research for Sustainable Development" discusses ethical questions in the research for SD especially on two levels. On the one hand, this concerns the elaboration and solution of specific societal problems and on the other hand the status of the sciences and humanities themselves in the solution of these problems. Research for SD committed itself to the goal of contributing to a more just society for present and future people. Therefore, scientific practice in this sector always takes place with a specific idea of future in mind. Hence, it is not neutral – and as a matter of fact, does not want to be neutral. In some disciplines, this may be cause for anxiety, but it does not constitute a problem as long as implicit normative attitudes, concepts, practices or objects are made transparent as such and included in a rational discourse. It is the aim of ethics in the research for SD to contribute to the facilitation and systematic configuration of this process.

Ethical challenges for scientists arise in the elaboration and solution of societal problems. First of all, in an application-oriented context, it has to be determined what needs to be done. This is decidedly not a purely empirical-technical-scientific but also a normative question. For instance, do approaches to a solution for resource conflicts encroach upon the rights of indigenous peoples? What consequences do technical solutions have in a specific social context? How can burdens be avoided or distributed fairly? The idea of co-design and co-production points out that neither the questions nor the solutions can be elaborated on a purely scientific basis.

Appropriately, it is always demanded that non-scientists should participate in the research for sustainable development right from the start. The reasons for this are:

(a) Solutions cannot be found by scientists alone, local knowledge is necessary, as well. This is even more true concerning decisions under circumstances of uncertainty, if sound scientific knowledge has not (yet) been found or can most likely never be found, but the call for action is immediate and waiting is no acceptable answer.

(b) Who determines what constitutes relevant knowledge for the solution of societal problems? This cannot be done by scientists alone.

Finding acceptable solutions can occur in a structured way and is not just the result of non-transparent societal mechanisms (impersonal governance structures) or individual decisionism ("Every scientist has to decide individually!"). Processes of deliberation rely on elaborating the factual as well as the normative basis in a comprehensible way.

This includes questions and methods of ethical judgement such as an ethics in the sciences and humanities can provide. However, ethics in the research for SD can contribute in a second respect: If, against the background of the enormous challenges of SD, the sciences and humanities have to restrict their programmatic value neutrality, it has to be reflected more carefully what this means for sciences of a new type in the sense of a normative co-design and co-production.

In this session, the basic questions as well as case studies related to practice shall be presented and discussed with all participants who are to contribute their own aspects.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Ethics in the research for SD is in itself already an interdisciplinary undertaking. It is based on the Tübingen approach of "Ethics in the Sciences and Humanities" which addresses questions of responsibility in the sciences and humanities themselves. Researchers do not pass ethical questions and problems which result in and from their scientific work to philosophical or theological experts but identify, analyse and evaluate them together with these experts as well as with other stakeholders. The challenge consists in detecting the moral and normative dimensions of scientific insights and technologies and in ultimately weighing alternative actions in a transdisciplinary and political way. For Future Earth, the dialogue between the sciences and humanities is a desideratum, as well – both for the ethical self-reflection of the community of researchers and with regard to the ethical questions of sustainable development.
The general structure of ethical judgement consists of descriptive and prescriptive elements and their integration in so-called mixed judgments. The elaboration of this structure and possible specific implementations in practice are an important methodical element not only in interdisciplinary but especially in transdisciplinary cooperation and co-production. Application-oriented ethics designed instruments such as the "ethical matrix" or other models of evaluation and judgement with the help of which ethical processes of reflection of different stakeholders can be elaborated and then fed into the political process.
Possibly, through the integration of ethics, the process does not become more complex, but rather simpler and more transparent, because normative and descriptive statements can be referred to one another without completely collapsing these aspects. The role of interdisciplinary ethics consists in making moral or ethical questions negotiable in an academic way for all participants in Future Earth.

Short description about of the internationalization potential of the suggested theme idea:

In a global perspective, there is a need for ethics expressed in different communities, so that the proposal can directly be connected to existing demands and discourses. Again, this is true for the ethical challenges of SD itself as well as for the normative foundations of the research for SD.
Especially if the aim is to find science-based solutions on different levels (local to global) it has to be considered further that there is no silver bullet: regionally adapted solutions have to be found which have to incorporate and consider the corresponding value systems. This is not a question of cultural value relativism („Anything goes!") but of argumentatively reaching solutions in different contexts which respect different normative orientations and do not simply export "Western" value systems. At the same time, regional practices which violate human rights or are otherwise not ethically justifiable are not to be legitimised.
The normative and evaluative orientation can be based on various international documents relating to human rights, on the agreements of the UN conference in Rio (Agenda 21, Convention on Biological Diversity...) as well as on internationally accepted ethical standards for research, which should then be elaborated for the objectives and agenda of Future Earth. Eventually this would lead towards an „Ethical points to consider in Future Earth research - with methodological suggestions for an ethical toolbox".

Regional solution for solving land use conflicts

Senatskommission für Agrarökosystemforschung der DFG
Federführung: Prof. Ralf Seppelt, Helmholtz-Zentrum für Umweltforschung Leipzig

Short presentation of the theme idea in the Future Earth context:

To achieve global food security several options are proposed, such as closing yield gaps, increasing agricultural resource efficiency and increasing food delivery by shifting diets and reducing waste (Foley et al., 2011). These are, however, recommendations on the global scale, which not easily translate into regional scale solutions. There is evidence that global food security is not directly linked to total global food production, as i) food production from smallholder farms is the backbone of global food security, ii) global food production is sufficient, but not available to the hungry, iii) food usage is inefficient, as one third is wasted and one third fed to livestock, iv) the EU '10% biofuel directive' causes increased food prices and contributes to rainforest destruction, and v) land grabbing and speculation on food commodities jeopardizes food availability to the poor (Tscharntke et al., 2012). Further increasing crop yields might not necessarily translate into biodiversity loss, while agro-ecological intensification may sustain ecosystem services. However, yields of the staple crops like wheat are stagnating in the main advanced wheat producing countries (Brown, 2012). Wildlife-friendly farming, which acknowledges the role of agro-biodiversity and the associated ecosystem services can sustain cultural ecosystem services and minimizes environmental costs3. Recent findings show that land management on the regional scale needs to provide the base for supporting global food security by identifying optimum compromises and solutions which balance sustainable intensification, agro-biodiversity and functional biodiversity as well as production and distribution. Simple scenario-based analysis might fall too short (Seppelt et al., 2013) as it does not reveal the full range of options and does not identify the most efficient solutions considering all possible trade-offs. Exploratory modelling should be applied to analyse and understand coupled socio-environmental systems. This needs to consider boundary conditions and feedbacks of the socio-economic system, such as the legacy of a landscape. There is thus no "one size fits all solution" (Václavík, et al., 2013). We recommend providing in-depth and evidence-based knowledge for sustainable increase of agricultural production, which makes use of field-based results and exploratory modelling. This will deepen our understanding of possible options for sustainable intensification in the given socio-economic context.

Brown, L. (2012) Full Planet, Empty Plate. Earth Policy Institute

Foley, J.A., et al. (2011) Solutions for a cultivated planet. Nature, 478, 337–342.

Seppelt, R., et al. (2013) Identifying trade-offs between ecosystem services, land use, and biodiversity: a plea for combining scenario analysis and optimization on different spatial scales. COSUST, 5, 1–6.

Tscharntke, T., et al. (2012) Global food security, biodiversity conservation and the future of agricultural intensification. Biol. Cons., 151, 53–59.

Václavík, T., et al. (2013) Mapping global land system archetypes. Glob. Env. Change, 10.1016/j.gloenvcha.2013.09.004

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The German community is involved in studying these research questions with an international perspective, for instance through DFG-funded Collaborative Research Centers (SFBs) as well as the Sustainable Land Management program of the BMBF. DFG funded Biodiversity Exploratories as well as long term ecological research sites may provide data for this kind of analysis.

Short description about of the internationalization potential of the suggested theme idea:

The drafted research agenda clearly has a global scale perspective. Global production of food doubled in the last four decades and out-pasted population growth (Green et al., 2005). Increase in production was achieved by an enormous leveraging of energy input (fertilizer, pesticides) as well as a doubling of irrigation but with a just modest increase of land use for agricultural crop production and permanent pasture (Foley et al., 2005). Food production per capita however is decreasing (Pimentel & York, 2011) and global food security is by far not achieved. There is a clear limitation of the resource land. A further increase of agricultural and pasture land will put higher pressure on regulating ecosystem services (water, climate, erosion) but also on biodiversity.

Foley, J.A., et al. (2005) Global consequences of land use. Science, 309, 570–4.

Green, R.E., et al. (2005) Farming and the fate of wild nature. Science, 307, 550–555

Pimentel, D. & York, N. (2011) Agricultural Production. eLS. Wiley Doi:10.1002/9780470015902.a0003254.pub2

The Role of the State in the Transformation towards Sustainability

Ines Dombrowsky, Jörg Faust, Katharina Stepping, Sebastian Ziaja,
Deutsches Institut für Entwicklungspolitik

Short presentation of the theme idea in the Future Earth context:

The sustainable use of natural resources and sink capacities is one of the key challenges for society in the 21st century – both for developed and developing countries. The current development path contributes to climate change, biodiversity loss and the degradation of ecosystems. It is feared that the overexploitation of natural resources and sink capacities will lead to crucial tipping points of the earth's ecosystem(s), with potentially dramatic effects for humankind (Rockström et al., 2009). This means that continuing business-as-usual is not an option and that energy systems, industrial production and natural resource use need to be transformed fundamentally towards sustainability in a short time period. However, the ability to do so will also differ among developed and developing countries and regime types.

One argument is that to achieve a green transformation (WBGU, 2011), the state will have to play a pivotal role. Despite an increasing relevance of civil society and international regimes in policy-making, the state will remain a decisive actor in the provision of environmental public goods, including clean air or water, a stable global climate or the fight against the loss of biodiversity. The extent to which states engage in the prevention of environmental degradation and as such in the provision of environmental public goods, however, depends on particular features, including the political regime and state capacity. Autocratic regimes may be capable of providing public goods but not willing, whereas democratic regimes may be willing but in particular young democracies might be limited in capacity. To further complicate the matter, incentives for providing local environmental public goods might differ from those for providing global environmental public goods. Hence research might explore the role of regime type and state capacity for local and global environmental good provision. Such work needs to build on inputs by political sciences, economics and natural sciences and related measurements of regime types, state capacity and the evolution of environmental status in various countries and the correlation among them. Macro-quantitative studies may be complemented by case studies that trace causal relationships between regime types, state capacity and environmental outcomes for different regime types and levels of capacity.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

From a scientific perspective, the research would be of interest to political scientists, economists and natural scientists concerned with the evolution and measurement of regime types, state capacity and environmental performance of states over time. This would inter alia involve building on existing efforts that develop indicators for these issues, identifying gaps and contributing towards the improvement of respective indicators. In particular the measurement of environmental performance and public good provision poses particular challenges. However, here links could also be established to work undertaken under topic 1 „Dynamic planet".

From a German and European political perspective, work on this topic would be relevant for the promotion of a green transformation within and outside the European Union.

Short description about of the internationalization potential of the suggested theme idea:

Given that many efforts to develop indicators for regime types, state capacity and environmental performance of states are undertaken outside of Germany, it will be important to embed the research into respective international initiatives and networks. Finally, the research outcomes will also be of particular relevance for non-EU and non-OECD countries.

Global system science: Collective action in complex and trans-jurisdictional systems

Jochen Hinkel und Carlo C. Jaeger

Short presentation of the theme idea in the Future Earth context:

Maintaining the functioning of global systems such as the climate system, the food system and the financial system has become one of the major challenges humanity is facing today. The challenge thereby arises due to two essential features these global systems share. First, they are complex, adaptive systems for which it is difficult or even impossible to provide detailed foresight. Second, even if we would have perfect foresight, there is no single authority that may exercise command and control because global systems span jurisdictional boundaries. The absence of a global social planer makes collective action amongst diverse actors with vested interests necessary in order to provide the public good of maintaining these systems.

These two features are particularly visible during crises. During the recent global financial crisis, for example, it became evident that standard economic models used for managing the financial system did not foresee the crisis and thus did offer little help in managing it. Furthermore, reorganizing the financial system in order to make it more resilient has by and large failed due to the diverse and vested interest of the involved governments, reserve banks, financial institutions and transnational firms. Another example is the climate crisis. Foresight is limited both due to irreducible uncertainties in the climate system and, even more so, due to human reflexivity with regards to reacting to the crisis and changing earth system interactions. Similarly, collective action towards an effective climate treaty is unlikely to come about due to vested interests amongst countries, as the recent climate negotiations have shown.

The emerging research field of global systems science (GSS) addresses these and similar challenges in global systems. The central question attempted to answer is: How can collective action in complex and trans-jurisdictional systems be attained? GSS addresses this questions through two novel approaches.

First, GSS is actor-oriented. GSS is not a purely academic exercise but a concerted effort amongst practitioners and researchers targeted at supporting practitioners dealing with global systems to reflect on their experiences and to assess possible consequences of their actions. Towards this end methods from complex adaptive systems and emerging fields in the context of social media and "big data" are applied. Distributed large scale computing and "big data", particularly text data, as well as new analytic methods, offer potential to improve our understanding of human behaviour in social and interactive contexts. For example, text analysis of sentiments expressed in email exchanges amongst bankers before the 2007 sub-prime mortgage crises revealed that simple indices based on word counts can serve as early warning signals of crises. Additionally, crowd sourcing and social media make it possible for much wider and deeper participation in decision making and as such may "correct" dysfunctional command and control structures.

Second, GSS is solution-oriented in that it focuses on win-win solutions. Generally, large-scale collective action problems in the absence of a third party that may enforce a solution are difficult problems, in particular when achieving collective interests means compromising on individual interests. Probably the most promising way of solving these problems is to identify win-win solutions, which solve the dilemma of collective action by providing alternatives which many reconcile conflicting interests. Technically speaking, the identification of win-win strategies converts a dilemma game into a coordination game, which is much easier to solve. The current climate debate, for example, is commonly perceived as a dilemma game where the individual interests of countries to maximise growth and welfare can not be reconciled with the global interest of reducing emissions to maintain a safe climate. This perception has led to the current deadlock in the climate negotiations. The assumption that reducing emissions will reduce economic growth is, however, by no means scientifically robust and finding alternatives that allow countries to grow whilst reducing emission offers win-win strategies for solving the climate dilemma.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

GSS offers great opportunities for the German scientific community, because it provides novel approaches for addressing global challenges. Furthermore GSS is already internationally recognized and thus offers the German research community European and global networks (www.global-systems-science.org).

GSS also offers a great integrative potential for several reasons. First, GSS is an international social science driven effort at integrating natural and social science and thus is complementary to other efforts such as Earth System Science and Sustainability Science which originated from the natural sciences. One specific feature of GSS is that it connects both natural and social sciences with the frontiers of computational methods in the context of "big data" and the Internet.

Short description about of the internationalization potential of the suggested theme idea:

International recognition of GSS is already emerging. In particular, the EU has started to issue calls for GSS research in its Horizon 2020 Programme. Two German Research Institutes, the Global Climate Forum (GCF) and the Institute for Advanced Sustainability Studies (IASS) play an active role in its further internationalization.

Transformation Patterns - An Integrated Framework for Transformation Research

Matthias Falke

Short presentation of the theme idea in the Future Earth context:

Der Transformationsprozess hin zu einer globalen, ökologisch, ökonomisch und sozial nachhaltigen Wirtschaftsordnung stellt unsere Gesellschaft vor die wohl größte Herausforderung in der Geschichte der Menschheit. Solange jedoch Umweltpolitik auf globaler Ebene mit Kostenpolitik gleichgesetzt wird, kann es hier zeitnah keinen sozial, ökonomisch und ökologisch verträglichen Kompromiss geben. Nur die politische Ebene hat jedoch die Kapazitäten und Ressourcen, um lokalräumlich wirksame Transformationspolitik zu betreiben. Erschwerend kommt hinzu, dass es an einem klaren Verständnis von Transformation jenseits der 2-Grad-Marke fehlt. Sinn, Ziele und Strategien der Transformation müssen global kommuniziert werden und dieser Diskurs in einer bindenden, nachhaltigen und koordinierten Strategie münden.

Obschon es ein Verdienst der Wissenschaft ist, den globalen Diskurs zu einer klimaverträglichen und nachhaltigen Gesellschaftsordnung anzustoßen, fehlt es bislang an einer systematischen Transformationsforschung. Weder gibt es eine zielorientierte und vor allem international kohärente Erfassung von Transformationswegen und -praktiken, noch eine kritische Überprüfung von vermeintlicher best-practice. Selten gelingt es, erfolgreiche Transformationspraxis und Transformationsstrategien aus ihrer lokalräumlichen Pfadabhängigkeit heraus zu lösen und wissenschaftlich vermittelbar zu machen. Quantitative Studien erforschen wichtige Zusammenhänge und Interdependenzen in Mensch-Umweltsystemen. Qualitative Fallstudien liefern beispielsweise wichtige Einblicke in lokalräumliche Spezifitäten. Meines Erachtens bleiben diese Studien jedoch bislang nur in einer Richtung wissenschaftlich anschlussfähig. Was fehlt ist ein kohärenter, ein systematischer Bezugsrahmen für Transformationsforschung.

„Transformation Patterns - An Integrated Framework for Transformation Research" ist daher mein Appell für einen systematischen Bezugsrahmen in der Tradition der Theorien mittlerer Reichweite. Dem „Integrated Framework for Transformation Research" liegt die sukzessive Erarbeitung, Systematisierung, Evaluation und Verbesserung von „Transformation Patterns" zu Grunde. Unter Transformation Patterns (TP) sind Muster, Strukturen und Schablonen gemeint, die im wissenschaftlichen Kontext erforscht und als transformationsfördernd im weitesten Sinne eruiert wurden. Transformation Patterns können sowohl bewährte technische Innovationen sein, z. B. computergesteuerte Steuerungsabläufe, Kraftwerke mit höherem Wirkungsgrad, Solarboiler et cetera. Gleichzeitig können TP Methoden sein, zum Beispiel systematische Strategien der Konsensfindung, des Konfliktmanagements aber auch Formen nachhaltiger Agrarwirtschaft. In Form von Soft Skills tragen TP in konkreten Formen von Erwachsenenbildung und Aufklärung zu klimafreundlichen Wirtschaftsweisen und schonendem Umgang mit Ressourcen bei, in Form von Bildung für Nachhaltige Entwicklung auch für nachwachsende Generationen.

TP und das zugehörige Framework sollen dabei nicht als normatives Konzept missverstanden werden. Das Integrated Framework for Transformation Research spiegelt vielmehr die soziokulturelle und naturräumliche Vielfalt des Erhebungskontextes in systematisierter Weise wider. Zu diesem Zweck sind TP nach drei Faktoren gegliedert: nach ihrem Typ (z.B. Methode), nach ihrer kontextspezifisch nachgewiesenen Wirkung (z.B. Energieeffizienz) und ihren Rahmenbedingungen (z.B. erforderliche Ressourcen/Standorteffekte). Transformationsforschung würde so in wesentlich strukturiertere Bahnen geleitet werden. Grundlagenforschung und kontextabhängige Evaluationen zu TP tragen zu einer immer besseren Differenzierung bei, decken Reboundeffekte auf und überarbeiten TP kontinuierlich. Die Systematisierung trägt ferner zu einer neuen Übersichtlichkeit von Transformationsforschung bei und ermöglicht die gezielte Aufarbeitung von Forschungslücken.

„Transformation Patterns - An Integrated Framework for Transformation Research" stellt für das Panel „Transformation towards Sustainability" des German Future Earth Summit 2014 einen meines Erachtens wichtigen Diskussionspunkt für einen

Themenworkshop zur Verfügung. Lösungsorientierte Forschung braucht einen international praktikablen Referenzrahmen, der eben nicht einseitige Lösungsstrategien propagiert und oktroyiert. Transformative und innovative Pfade müssen im lokalspezifischen Kontext selbst gefunden werden. Wissenschaft kann dazu den Beitrag leisten, in Form von „Transformation Patterns“ Lösungswege wissenschaftlich aufzubereiten, zu prüfen und diese Erkenntnisse auf globaler Ebene zu vernetzen. Die Existenz eines solchen kohärenten Bezugsrahmens würde die Chance erhöhen, den Transformationsprozess hin zu einer ökonomisch, ökologisch und sozial nachhaltigen Gesellschaft zu beschleunigen.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

„Transformation Patterns - An Integrated Framework for Transformation Research“ steht in dessen Grundkonzeption für die praxisorientierte systematische Bündelung interdisziplinärer Forschung. Der international hoch geschätzten deutsche Expertise ist in diesem Kontext in Form von technischem Know-How, dem enormen Innovationspotentials als auch der sozioökonomischen Vorreiterstellung ein essentiell wichtigen Stellenwert beizumessen. Die Erforschung, Entwicklung und Diskussion von Transformation Patterns erfordert dabei abseits adäquater Forschungsbedingungen vor allem den interdisziplinären Dialog. Rebound-Effekte zeugen von einer bislang defizitären Vernetzung zwischen Sozialwissenschaften, Wirtschaftswissenschaft und Naturwissenschaften.
Die Elaboration von Transformation Patterns soll daher eine wissenschaftliche Grundlage schaffen, Transformationsforschung zu systematisieren und in ihrer Vielfalt dialogfähig zu machen. Eine botanische Grundlagenstudie zu Wachstumsverhalten alternativer Nutzpflanzen im ariden Milieu soll beispielsweise im interdisziplinären Kontext reflektiert werden, um mögliche Nebeneffekte aufzudecken. Wirtschaftswissenschaften könnten beispielsweise in einer Machbarkeitsstudie ökonomische Verdrängungseffekte zugunsten einer aufgeklärten Kleinbauerelite feststellen. Transformation Patterns werden so durch interdisziplinäre Evaluierung sukzessive verbessert.
Ein integrierte Transformationsforschung würde so zu einer interdisziplinären Anschlussfähigkeit der Fachdisziplinen beitragen. Kausalbeziehungen und systemische Wechselwirkungen treten so zunehmend in das Bewusstsein von TransformationsforscherInnen. Dieser Prozess würde zu einer wachsenden Ausdifferenzierung und qualitativen Güte von Transformation Patterns beitragen.

Short description about of the internationalization potential of the suggested theme idea:

„Transformation Patterns - An Integrated Framework for Transformation Research“ zielt gleichermaßen auf eine interdisziplinäre Vernetzung auf internationaler Ebene ab. Der Vorteil von Transformation Patterns ist, dass eine wissenschaftlich-systematische Aufbereitung der Vielfalt an transformationsrelevanten Teillösungen dem internationalen „Flickenteppich“ lokalräumlicher Mensch-Umweltsysteme gerecht wird.
Auf lokalräumlicher Ebene lassen sich individuelle Transformationsstrategien realisieren, die zum Teil aus lokalräumlich interpretierten und implementierten Transformation Patterns sowie eigenen Ansätzen bestehen können. Der Dialog zwischen Wissenschaft und Praxis trägt so auf nationaler Ebene zu praxisnahen und lokalräumlich praktikablen Transformation Patterns bei. Der internationale wissenschaftliche Dialog trägt dann zu einer Annäherung im Transformationsverständnis bei gleichzeitig produktiver Ausdifferenzierung von Transformation Patterns bei.
Das TP „Technik zur Konstruktion von energieeffizienten Strohballenhäusern aus nachwachsenden Ressourcen“ erhoben im Ökodorf Sieben Linden in Deutschland, kann beispielsweise mit den Erfahrungen zur Konstruktion von Schilfhäusern auf den Philippinen vergleichen werden. Internationaler und interdisziplinärer Austausch können dann zu einer technischen Verbesserung (z. B. „wetterfest“) und lokalräumlichen Neuanwendung (z.B. in Guinea) solcher Transformation Patterns beitragen. Dieser iterative Prozess zwischen Wissenschaft und Praxis auf internationaler und interdisziplinärer Ebene impliziert die Chance einer systematischen Verbesserung und Beschleuningung von Transformation durch Vernetzung. „Transformation Patterns - An Integrated Framework for Transformation Research“ stellt dabei die institutionelle Schnittstelle für Wissenschaft, Politik und Wirtschaft dar.

The Global Arctic - Arctic and non-Arctic Interactions and Feedback Loops

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Short presentation of the theme idea in the Future Earth context:

The Arctic region is climatically one of the fastest changing regions worldwide - most vividly exemplified by the decreasing extent and volume of Arctic sea ice over the last decades. This rapid climate change in the Arctic is mostly attributed to consumption behavior in industrialized, developed countries beyond the Arctic's southern borders, specifically the increasing emission of greenhouse gases like CO2 and short-lived climate-forcing pollutants (SLCPs).

The warming climate, of course, alters the Arctic itself environmentally, geopolitically, and socio-economically, including changing livelihoods and cultural patterns, changes in permafrost conditions and in infrastructures and demographics. These transformations are driven in particular by activities such as exploration and extraction of oil and gas resources on Arctic continental shelves, increasing Arctic shipping, especially along north-eastern routes, as well as expansion of Arctic tourism, which all become technologically and economically feasible in the newly accessible areas especially offshore.

All of these changes also affect regions beyond the Arctic, such as Europe, North America and Asia. Examples include changing weather patterns in mid-latitudes and related effects on crop yields, air quality, and rising sea level expected in the case of a significant melting of the Greenland ice sheet. Further, with increasing extraction of Arctic resources and related infrastructure and transport development, SLCP emissions will rise, which may further accelerate the co-transformation of Arctic and non-Arctic regions. The next decade will be especially critical, as major political and economic decisions will be made despite significant uncertainty on how the Arctic landscape will actually develop. In the context of these feedback mechanisms and interdependencies between Arctic and non-Arctic regions, investigating Arctic climatic, ecological, social, political, legal, and economic transformations triggered by climate change and mainly driven by resource utilization is highly relevant not just for the Arctic itself, but certainly also beyond the Arctic. Because of the complexity of the issues involved from aspects of natural and social science and humanities, an interdisciplinary and stakeholder-centric transdisciplinary approach, which is at the core of the Future Earth mandate, is crucial for making significant progress in this research.

Against this background, the Institute for Advanced Sustainability Studies (IASS) has established a research project on Sustainable Modes of Arctic Resource-driven Transformations (SMART). The research group consists of an interdisciplinary team from the social and natural sciences such as geography, economics, public policy, physics, and chemistry, and from humanities, including law, philosophy, and ethics. The overarching goal is to contribute meaningfully to scientific understanding, participatory governance, effective decision making at multiple levels, and overall sustainable development of the Arctic. The initial geographic focus of the SMART project is on Norway and Western Russia (Eurasia) because of the importance of the relationship between fossil fuel extraction in that region and the demand from EU and Asian countries.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

The implications for Germany in this study of Arctic transformations and the mutual feedback for non-Arctic regions are substantial and perhaps critical. This is apparent in light of the fact that Russia and Norway together account for 75% of the gas imported to Germany. Also the share for oil is significant: 46% of German oil imports come from Russia and Norway. Of at least equal importance will be the effects of political, legal, economic, climatological, and technological changes. The impact will likely be felt, for example, in the mix of energy supply for the Energiewende, German shipping industry share of Arctic marine transport, and development of Arctic-adapted extraction and shipping technologies. In turn, key national political decisions and the (currently rather uncertain) fate and future development of the German Energiewende as well as the developments in energy mix and grid development in other European countries, and on the European Union level generally, will co-determine the level and pace of Norwegian and Russian Arctic oil and gas development.

In addition, there are several research organizations in Germany working on the Arctic. This includes first and foremost the Alfred-Wegener-Institute, but also several other organizations working on natural and social science Arctic research , such as the Institute for Advanced Sustainability Studies (IASS), the Potsdam Institute for Climate Impact Research, the German Research Centre for Geoesciences, the German Institute for International and Security Affairs, and the Ecologic Institute. However, when it comes particular to Arctic/non-Arctic interactions, for example Arctic-Europe, Arctic-Asia or Arctic-Americas interactions, several more research organizations and university research groups from both natural and social sciences, could become interested. The German Institute for International and Security Affairs, for example, is currently planning to include Asian actors and perspectives in its Arctic research portfolio, and also conducts research concerning Germany's role in Arctic affairs. Further, the IASS is developing an explicitly interdisciplinary Arctic research program, including both natural and social science expertise.

Short description about of the internationalization potential of the suggested theme idea:

This theme of feedback between the transformations between Arctic processes and the non-Arctic world is intrinsically international in its scope. In addition to the feedback system between the Eurasian Arctic and European countries, the interplay between the economic and political strategies regarding fossil fuel extraction in the Eurasian Arctic and North America is highly relevant, as is also the increasing role of the southeastern Asian countries in shipping across the Arctic and mineral extraction in the Arctic. The Fridtjof Nansen Institute in Norway, for example, has already established a research group to study Arctic and Asian interactions, aiming to contribute new and relevant knowledge on the Arctic interests of China, Japan, Korea and India. These research efforts could be linked with broader studies on Arctic/non-Arctic interactions and comparative studies with other regional foci, such as the IASS focus on Arctic and European interactions.

Policy Analysis for Eco-Innovation Policy in promoting Sustainable Electronic Industry in Germany

Azhan HASAN

Short presentation of the theme idea in the Future Earth context:

Innovation policy design which lead to system innovations may assists in 'complying with the limits' as it involves 2 dimensions-the environmental and social. Any approach that integrates the notion of limited resources and social sustainability "explicitly relating the set of social and environmental goals and norms of economic (market) activity" (Bartelmus 2002). In line with that, Foxon et al (2005) argue "the challenge of sustainable innovation policy is to develop enabling policy frameworks, strategies and processes that support technological and institutional innovation in ways that appropriately encompass the economic, environmental and social dimensions of sustainability". Innovation policy which is achieved in this way will promotes economic growth only as long as it complies with a long-term sustainability goal by avoiding over-consumption of resources or social divisions.

Germany's environmental innovation (eco-innovation) approach is based on supply-side driven by targeting the compliance to regulation entirely on manufacturers and importers. This will show that the co-ordination issues for market innovation between investors-adopters and innovators-investors are crucial in Germany from the policy perspective. Many responsibilities for innovation support are decentralized to the state level in Germany in addition to the role of the federal government. That means, the policy co-ordination which is dealing with eco-innovation always involved multiple domains through various co-ordination between several ministries in Germany. This will require a policy analysis to determine the effectiveness of policy co-ordination in dealing with the promotion of eco-innovation in Germany aimed to sustain and ‚green' their electronics industry. The intended policy analysis will:

1. determine the institutional set-up that effect eco-innovation through utilization of innovation friendly environmental policy styles.

2. investigate the sustainability of energy usage and environmental quality of existing eco-systems influenced by the institutional set-up in the governance of eco-innovation.

3.analyze the development and implementation of policy strategies and instruments of sustainable development used that affected by institutional changes and governance of eco-innovation.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany should create a lead market condition which is supported by innovation-friendly regulation and sets the model for other countries to follow their regulatory path (Blind et al. 2004; Beise and Rennings 2005; Walz 2007). This correlate to varied situation listed below:

1. The demand for environmentally friendly technologies depends very much on the ability of regulation that will ‚correct' or improve the market failures which is consists in the externality of the environmental problems (Rennings 2000). The demand will be much lower, and their effects are less likely to be strong without well-designed regulation.

2. The German national regulation should not lead to an innovation that can be only applied under very specific national regulatory regime, or called as an idiosyncratic innovation. In contrast, the regulation should be shaped and designed to diverse technical solutions, which later will increase the opportunity that can be fit into the preferences of imitating (importing) countries.

3. The German national regulation should set the standard for the regulatory regime which possibility that will enable other countries to adopt. The German suppliers as a leading country have additional advantages on the world market, because they have adapted their technologies early on to pass and comply with the requirements of such a regulatory regime. Later, this will helped in developing the administrative capabilities in dealing with innovation friendliness capability.

Short description about of the internationalization potential of the suggested theme idea:

The policy portfolio in Germany is definitely focused on the supply side of technologies and involves a broad range of instruments such as research and development (R&D) support programmes; promotion of demonstration and commercialisation of technologies; renewable energy generation and energy efficiency; establishment of networks and partnerships and information services. These consist of regulations and standards as well as an instrument focusing on possible technology and know-how transfer to developing countries through research collaboration and policy learning, as well as, policy diffusion (ETAP, 2009).

The policy approach applied in Germany have predominantly supports the development and diffusion of innovative technological solutions. The technological focus is clearly put on integrated, efficient technologies and the use of renewable energy. This can be seen when Germany able to come out with the most effective support schemes for electricity from renewable energy sources (Erneuerbare Energien Gesetz) as their demand side instrument. This also confirm the aspect of the selected measures or instruments for effective or successful policy that enable Germany as one of the world leaders in environmental technologies and supplies a broad range of technological options, through a share of 32% to 54% of German patents (ETAP 2009) and 46% for all technology patents (OECD, 2008b).

Improving energy efficiency policies in developing countries through behavioural insights

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Short presentation of the theme idea in the Future Earth context:

In developing countries, energy efficiency can contribute to tackling several sustainability challenges: in its environmental dimension, it helps to avoid energy related greenhouse gas emissions. In its economic dimension, it improves energy intensity of industries and thus competitiveness. In its social dimension, it can free resources hitherto bound in energy consumption and make them available for other basic needs. It therefore forms vital part of most energy strategies and their respective policies. At the same time, low current levels of efficiency in many developing countries open up potential for low cost measures.

However, in many cases these potentials do not materialise. One reason may be the prevalent focus on finance and technology, following the neoclassical economic assumption that profitable investments will be undertaken in a functioning market. In real life, however, humans are not always as rational and utility-maximising as would a true homo economicus. In contrast to the assumptions of neoclassical economics, they often act irrationally and contradictorily: they have biases for the familiar and things they already own, holding on to them even in cases of economic loss; they prefer a limited number of choices over many; and they procrastinate. In contrast to maximizing their self-interest, they can be motivated by altruism, fairness, and commitment, or by competing with others.

These principles of behavioural economics matter for energy efficiency policy design because they are often the root causes of non-technical barriers to energy efficiency uptake. People prefer things they already own and they want to stick with their habits, even if this means wasting energy and money. Incorporating the insights of behavioural economics into energy efficiency programmes may help to motivate people to overcome this inertia. Taking efficient light bulbs as an example, a deployment programme may
- Provide information about available products, but limit the number of choices so as to avoid choice overload,
- Ensure new products deliver similar services as familiar ones (e.g. same light colour), and
- Shift gains to the near-term and costs to the future (e.g. by designing financing schemes).

To date, research on the implications of behavioural insights for energy efficiency policy is still in its early stages. The implications are relevant for all countries, and Germany is not at the research or policy design forefront. Lessons could thus be learned far beyond the developing country context alone.

However, this focus may be particularly novel and promising. Research on behavioural insights for energy efficiency policies in developing countries is virtually non-existent, despite its high potential. By suggesting the theme ‚Improving energy efficiency policies in developing countries through behavioural insights', we aim to spark the discussion within the German research community and contribute to closing the research gap.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

This theme is likely to be of interest to several German research communities. First, there is the development research community, particularly those who work on the connection between energy and development. Second, there is the energy research community, which is likely to take an interest in bringing Germany to the cutting edge of behavioural science applications to the area of energy. Third, there is the behavioural science community, where research on developing countries still shows large gaps, particularly when concerned with energy topics. Fourth, the environment and climate communities are likely to be interested in results which may inform German national as well as international frameworks.

Integrating natural and social sciences, the suggested theme lends itself to cooperation between psychologists and cognitive scientists on the one hand and social scientists of various disciplines on the other hand, such as economists, political scientists and development scientists.

Short description about of the internationalization potential of the suggested theme idea:

Since this theme is likely to produce insights on human behaviour and its relation to energy efficiency in general, it will be of interest to researchers and policy makers in any country. The specific focus on developing countries will further strengthen its internationalization potential.

Developing internationally agreeable assessment criteria for Climate Engineering

Prof. Gernot Klepper, Ph.D., Prof. Dr. Andreas Oschlies

Short presentation of the theme idea in the Future Earth context:

Some scientists and politicians discuss the possibility of using Climate Engineering (CE) to deal with climate change. CE describes large-scale technical methods that could be used to reduce the concentration of CO2 in the atmosphere or to reduce incoming solar radiation. The debate on CE is complex and controversial. On one hand there is the hope that CE methods may help to avoid potentially dangerous climate change, on the other hand there are several concerns: because of its global impacts, it might be impossible to carry out CE in a responsible way, and a failure to understand how CE could affect the complex Earth system might have catastrophic consequences. Nevertheless, already talking about an option CE may redirect society away from mitigation efforts.

What are the potentials, risks, and perceptions of CE? Despite the interest in CE there is only little reliable information at hand to assess its options. Any comprehensive evaluation of CE must include technical, scientific, social, political, legal, and ethical aspects, has to consider both the short- and long-term, and the regional and global dimensions. So far very little attention is given to this multidimensionality of CE in the international research community. Since May 2013 these aspects are approached in a broad interdisciplinary Priority Program "Climate Engineering: Risks, Challenges, Opportunities?" funded by the German Research Foundation. Key goal of the Priority Program is to reduce the large uncertainties in our current understanding of the environmental, societal and political risks, challenges and opportunities of CE to create a scientific basis for a responsible approach.

Whereas the Priority Program is focussed on academic activities, the normative criteria for assessing CE options should be developed in a transdisciplinary framework as proposed by the Future Earth's co-design and co-production of knowledge paradigm. They should also be developed in an international collaborative context, since CE interventions are global and the positive as well as negative side effects of CE are unequally distributed around the globe. Criteria for assessing CE are also likely put into differing perspectives within other national and cultural settings (e.g. faith in progress and technology, attitude towards the natural environment, extent of threat posed by climate change). Therefore the Future Earth topic proposed here is to initiate an international collaborative framework for the development of internationally accepted criteria required to responsibly assess the option CE on a scientific and political level.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

As a Future Earth topic, the here proposed subject of developing internationally agreeable assessment criteria for CE in relation to the national approach pursued in the DFG Priority Program would provide useful input to the ongoing German scientific debate and make the high level of German interdisciplinary research on CE more international visibility – especially to political stakeholders.

Short description about of the internationalization potential of the suggested theme idea:

The here proposed Future Earth topic has by definition an international scope. It would merge similar attempts to provide guidance for the assessment criteria used to judge CE measures such as those in the UK. The proposed topic should be an important cornerstone for Future Earth if it is to organize and promote research on CE.

Transformations to low carbon societies: How resilient and sustainable can these transformations be?

Claudia R. Binder (Dept. of Geography, LMU), Rolf Hennicke (Dept. of Informatics (LMU), Wolfram Mauser (Dept. of Geography, LMU), Michael Meyen (Dept. of Comm. Science and Media Research, LMU) , Andreas Rathgeber (Inst. of Materials Resource Management, Uni-Augsburg), Markus Vogt (Dept. Theology, LMU)

Short presentation of the theme idea in the Future Earth context:

Transformation towards low carbon societies requires the coupled transformation of Social-Ecological and Social-Technical Systems (SETS), which is an extraordinarily fruitful field of interdisciplinary research. Scholars have pointed out that these transformations may require radical, systemic shifts in deeply held values and beliefs, in patterns of social behavior, and in multi-level governance regimes. From a research perspective, conceptualization and modeling of Social-Ecological and Social-Technical Systems (SETS) and new integrative, interdisciplinary research approaches considering the interaction between different subsystems are required.

The research theme proposed aims at understanding when, why and how transformations of SETS emerge, and what their dynamics and outcomes are and when these outcomes are resilient and sustainable. Even though scholars have put significant effort in studying case specific transformations, there is little theoretical and model-based understanding on how the dynamics of the subsystems making up SETS (ecological, technical, social, economic, cultural subsystems etc.) are interrelated and impact on the development pathways of SETS. The latter can develop into a persistent, an adaptive system or completely transform into a new system with a new equilibrium. Where the thresholds for the development into these different pathways lie and whether the new system will be resilient and sustainable is a key and open question.

To understand the transformation dynamics of SETS, research approaches are required which are able to: (i) address the multidimensionality of societal transformation; (ii) provide an integrative and interdisciplinary modeling framework to understand and simulate the relations between the ecological, technical and social systems within a transformation process; (iii) provide ex-ante simulations of transformation pathways by simulating scenarios of SETS; and (iv) assess the outcomes of the transformation from a sustainability and resilience perspective. The following aspects could be addressed in this theme:

Social-ecological and Social-technical Systems Framework. One of the main contributions of this theme should be the development of an integrative and generic framework for modeling transformation pathways of SETS. In particular, the framework should facilitate the integration of the dynamics of the subsystems making up SETS (e.g., ecological, technical, social, economic and cultural subsystems). How can the transformation dynamics in the different subsystems be identified, analyzed and integrated? What are the most salient driving, moderating and impeding factors affecting the transformation dynamics of each subsystem and how are they interrelated? How can we identify qualitatively and quantitatively ex-ante thresholds for system state transformations? When do these transformations lead to a new system state and when does this new state become resilient? To answer these questions simulations will be performed on top of a prototypical implementation of the modeling framework.

Scales. The application of the transformation framework at different scales (e.g. regional, national, international) and the interactions thereof is another key aspect of the theme. Thereby the role of the different scales for achieving or hindering the transformation to a low carbon society should be analyzed. For example, a transformation of the energy system at the regional level might support the transformation at the national level; however, the transformation at the national level requires the one at a regional level. i.e., how are various energy systems linked through integrated or disintegrated markets?

Agents. The agents, their interactions and their governance structure are also a key for the transformations towards low carbon societies. Who are the pioneers? In which time cycles do they decide? What are their decision parameters? To which extent are they influenced by each other? Here an important role can be attributed to mass and social media in general who play a key role both in communication and knowledge transfer and

in legitimization processes. How can mass and social media be used for the public acceptance of new development pathways? How do they influence transformation and resilience of new states?
Norms. Any transformation requires reflection on goals and justice issues. A low carbon society definitely includes a deep shift in understanding welfare. It has to combine models of sufficiency with incentives for technological und social innovation. The ethical problem is that sufficiency is a question of lifestyle and individual autonomy. It needs a public discussion about the question "How much is enough?" If we define resilience as a goal of social development we have to ask "What does it mean for which groups of society?". It has also to be combined with an analysis of justice. "What does just burden sharing mean on a global level in times of climate change?". That is, we need a new contract of society. This implies that institutions of knowledge-producing, of democratic decision-making and of public opinion-leadership have to communicate in new ways about the ethical basics of development.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

This theme has a high potential for integration between natural, social sciences and humanities, as it develops an integrative framework for analyzing, simulating and assessing transformations towards low carbon societies. The team of researchers proposing this topic is already interdisciplinary and has experience of interdisciplinary research within Germany and internationally.
Part of the team of researchers proposing the theme is also involved in the „Bayrischer Forschungsverbund ForChange", which aims at analyzing current change processes such as climate change, resource scarcity, energy transitions and financial developments. A key aspect in this „Forschungsverbund" is the relation between transformation and resilience and the question how our societies can become „Fit for Change".
In Germany, several institutes and faculties are very likely to get involved in this topic. A few of them will be mentioned below.
The newly founded Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys) at the Humbolt University of Berlin aims at conducting interdisciplinary research for reaching a better understanding of societal opportunities and limitations within the context of current transformation processes in human-environmental systems.
The Potsdam Institute for Climate Impact Research (PIK) has within the research area Climate Impacts and Vulnerabilities a flagship project on Sustainable Transition Pathways.
At the University of Bremen, in the research center on sustainability (artec), current research projects deal with questions of global change and transformation of societies towards sustainability.
The Center for Environment and Systems Research (CESR) at the University of Kassel also investigates into transformation of social ecological systems by developing strategies that support sustainability and help eliminate future problems or that allow to adapt to unalterable system changes.
Leuphana University has a faculty of Sustainability studying societal development towards sustainability.

Short description about of the internationalization potential of the suggested theme idea:

At an international level, we are directly involved with the European Group for the Study of Social-Ecological and Social-Technical Systems (Claudia R. Binder: founding member). Within Europe potentials for internationalization exist with TU Delft, Faculty of Technology, Policy and Management, who are experts in modeling transitions of socio-technical systems with focus on energy; the Stockholm Resilience Centre in Sweden, which is an interdisciplinary center with focus on research of governance of coupled social-technical systems for a transition towards sustainable development; the Tyndall Center, which performs inter- and transdisciplinary research in the area of adaptation to climate change and brings together social, natural sciences and humanities; and the Center for Development and Environment, University of Berne, who focuses on transformations of SETS from a North-South perspective.

Furthermore, in the USA this theme has a high potential. Key players thereby are the Resilience Alliance, USA focusing on resilience of SETS; the Global Institute for Sustainability, Arizona University, having a focus on sustainability and several researchers involved in transition and resilience research; and Center for International Earth Science Information Network (CIESIN) at the Earth Institute, Columbia University.

Zukünfte im Anthropozän gestalten, aber wie? – Entwicklung neuer integrativer Bildungs-und Kommunikationskonzepte als Voraussetzung für eine große Transformation zur Nachhaltigkeit

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Kurze Darstellung des Themas im Future Earth Kontext:

Weitvorangeschrittenistdie Einsicht, dassweder Politik, noch Umweltgruppen, noch die Wissenschaft allein die notwendige Transformation zur Nachhaltigkeit auf globaler Ebene gestalten können. Der WBGU setzt daher auf die Notwendigkeit eines globalen (virtuellen) Gesellschaftsvertrags, bei dem innovative Unternehmen, Vordenker, Vereine, Wissenschaft und Behörden in einem engen Miteinander die Transformation gewährleisten sollen. Dazu sind nicht nur neue politische Rahmenbedingungen nötig, sondern insbesondere ein gesellschaftlicher Konsens zur Notwendigkeit der Transformation, dabei insbesondere auch zur transdisziplinären Verschränkung von Wissenschaft, Stakeholdern und der breiten Gesellschaft. Dies erfordert jedoch neue Formen von Bildung, Kommunikation und Partizipation, für die wissenschaftliche Konzepte und Umsetzungsvoraussetzungen in allen Skalen noch überwiegend zu entwickeln sind. Vereinfacht gesagt interagiertdie anthropozäne Welt, in der Natursphären und Soziosphären zu einem System verwoben sind, in systemischer Weise, Bildung und Kommunikation sind jedoch noch überwiegend sektoral strukturiert. Auch ist die Bedeutung der Wissenschaft sowie die Notwendigkeit des Handelns, insbesondere bei der Beantwortung von Zukunftsherausforderungen auf vielen Ebenen umstritten, was unterschiedlichste Ursachen umfasst und von lobby-getriebenen Vetospielern über soziologisch nachvollziehbaren Schuldzuweisungen an Gruppen, bis hin zu psychologisch noch besser zu untersuchenden Selbstentschuldigungsmechanismen reicht. Auch der Umgang mit Wahrscheinlich-keiten, Skalenunterschieden, verzögerten Ursache-Wirkungszusammenhängen sowie Allmendegütern ist, zumindest wenn es über die persönliche Raum- und Zeitskala hinausgreift, ungeübt und fremd.
Der WBGU forderte in seinen letzten beiden Hauptgutachten (2011, 2013) daher zusätzliche Formen von Forschung und Bildung: Transformationsforschung-/Bildung soll insbesondere die Bedingungen der Möglich-keiten für die Transformation untersuchen und daraus neue Bildungs-/Kommunikationskonzepte entwickeln. Transformative Forschung soll sektorale und weitere transformationsrelevante Forschung um notwendige systemische Aspekte erweitern – transformative Bildung ist dann für deren Verständnis, Legitimierung, Diskursfähigkeit und Partizipation unabdingbar. Der vorliegende Vorschlag hat zum Ziel, die hierzu notwendige Bildungs- und Kommunikationsforschung zu Zukunftsthemen transdisziplinär zu entwickeln, um umwelt- und soziopsychologische Aspekte zu bereichern und entsprechende Umsetzungsformen dazu theoretisch und experimentell zu erproben. Insgesamt wird erwartet, dass die Anthropozänmetapher (weg vom Dualismus Mensch – Natur, weg von der Umweltforschung und –bildung, hin zur „Unswelt-"forschung und –bildung, Leinfelder 2011, 2013) hilfreich ist, um Zukunftsverantwortung, aber auch Zukunftsfähigkeit und Freude an der Einbindung jedes einzelnen für eine große Transformation zur Nachhaltigkeit zu ermöglichen. Im Detail sollte hierbei auf folgendes fokussiert werden:

- Untersuchung der Rolle der Bürgerpartizipation für die Legitimierung von Forschung und die Umsetzbarkeit wissenschaftsbasierter Handlungsempfehlungen
- Untersuchungen zur besseren Erfahrbarkeit und Visualisierung möglicher Zukunftspfade (etwa BAU, reaktiv, suffizient, bioadaptiv-konsistent, high-tech bzw.effizient) durch die Entwicklung neuer Kommunikations- und Verhandlungsformen (augmented reality, Zukunftsausstellungen, partizipative Comics, Zukunftstheater, Experimentiercamps, Versuchsküchen, Urban Farming, Wohnformerlebnisse im Urlaub uv.m.)
- Wissenschaftliche Untersuchung und Erprobung neuer Diskurs- und politischer Input-Formen (etwa beratende Zukunftskammern, WBGU 2011).
- Integration von Selbstreflexion eigener Verhaltensmuster und –reaktionen in die Bildung, etwa durch interaktive urbane Spiele, Design Thinking Methoden im Schulprojektunterricht uvm.

siehe auch: Leinfelder, R. (2013): Assuming Responsibility for the Anthropocene: Challenges and Opportunities in Education.- In: Trischler, H. (ed.), Anthropocene - Envisioning the Future of the Age of Humans, RCC-Perspectives, 2/2013, 9-18, Rachel Carson Center, Munich.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Die oben beschriebene Rahmenaufgabe kann nur durch direkte Kooperation von Natur-, Technik-, Kultur-, Sozial- und Geisteswissenschaften erreicht werden. Der Vorschlagende hat Erfahrungen in unterschiedlichsten interdisziplinären Gruppen (WBGU, Rachel Carson Center, Anthropozän-Projekt am Haus der Kulturen der Welt, Exzellenzcluster Bild-Wissen-Gestaltung etc.). In der Forschungsallianz, aber auch an den deutschen Universitäten sowie in weiteren Forschungseinrichtungen (z.B. Wuppertal-Institut, Kulturwissenschaftliches Institut Essen uvm) gibt es wichtige Bildungs- und Kommunikationsforschungs-gruppen unterschiedlicher Ausrichtung, die interessierbar sind bzw. bereits umfassendes Interesse gezeigt haben. Enge Kooperation des Autors findet etwa mit dem Institut Futur an der FU-Berlin (auch innerhalb der UN-Dekade für BNE), mit dem IPN-Kiel uva. statt.
Zukunftsforschung wird in Deutschland umfassend betrieben, ist jedoch teilweise sehr heterogen verteilt, was es gemeinsam mit innovativen Firmen, welche Zukunftstechnologien (Mobilität, Wohnen, Leben, Ernährung, Energie, IT, uvm.) entwickeln, insb. hinsichtlich gemeinsamer Bildungs- und Kommunikations-erfahrung und -forschung zu Zukunftsthemen zu bündeln gilt. Institutionen wie etwa die Hasso-Plattner-School of Design Thinking, PIK, IASS, KIT, aber auch viele Kunst-, Design- und Architekturhochschulen können hier zusätzliche wichtige Partner sein.
Auch die deutsche Forschungsmuseumslandschaft stellt sich zunehmend auch auf Zukunftsfragen ein (Motto insb. aus der Vergangenheit für die Zukunft lernen), auch hier sind neue, z.T. hybride Formen, gemeinsam mit Künstlern, Filmemachern, Szenographen, Museologen, neuen Medien und Zukunftsforschern zu entwickeln. Eine zentrale Rolle kann hier das zukünftige „Haus der Zukunft" in Berlin einnehmen, um neue vernetzte, experimentelle, partizipative, journalistische, diskursive und iterative Kommunikationsformen zu implementieren, zu testen und empirische Forschungsdaten zu liefern.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:
Der hier geschilderte Vorschlag sollte von vorneherein auf Internationalisierung angelegt sein. Kommunikation über potenzielle Zukünfte impliziert bereits, dass je nach kulturellem, gesellschaftlichen und regionalen Umfeld unterschiedliche Zukünfte vorstellbar sind, deren interkulturelle Verhandlung und Mischung nicht nur die notwendige „Glokalisierung", sondern eben auch interkulturelle Anregungen ermöglichen wird. „Leap-Frogging" wird für die große Transformation notwendig sein, nicht nur in Schwellenländern, sondern auch in Industrienationen.
Der Autor ist Mitglied in der offiziellen internationalen Working Group on the ‚Anthropocene' der International Commission on Stratigraphy, in der auch internationale Kommunikations- und Bildungsthemen eine wesentliche Rolle spielen (http://quaternary.stratigraphy.org/workinggroups/anthropocene). Weiterhin arbeitet er im Rahmen des (von ihm mitinitiierten) „Anthropocene Projects" am HKW-Berlin derzeit an einem Anthropocene Curriculum, unter extrem hoher internationaler und interdisziplinärer Beteiligung. Er leitet hier u.a. eine Untergruppe zu „Slow Media for the Anthropocene", bei der es etwa in Kooperation mit Kollegen aus Australien und New York um die wissenschaftliche Etablierung neuer Ausstellungsformate für Zukunftsthemen, aber auch das Potenzial von Sachcomics geht). Innerhalb des Exzellenzprojekts Anthropocene Kitchen des Autors läuft ein interkulturelles internationales Kommunikationsteilprojekt. Enge Kooperation besteht u.a. auch mit globaia.org, welche auf Visualisierungen für das Anthropozän spezialisiert sind. Es besteht Konsens bei den meisten internationalen Earth Science oder Sustainability Zentren, dass Bildung und Kommunikation eine wesentliche Rolle bei der Bewältigung von Zukunftsaufgaben spielen muss, wobei gerade auch andere Formen als klassische Schul-, Umwelt- und Nachhaltigkeitsbildung international gefragt sind. Deutschland kann hier einen großen Beitrag auch zur internationalen Vernetzung leisten, sofern nicht nur in schulischer und sektoraler Weiterbildung gedacht sondern Kommunikation für das Anthropozän auf ein globales Niveau angehoben wird.

Potenziale für Transformation und Governance

Dr. Edgar Göll, IZT Berlin

Kurze Darstellung des Themas im Future Earth Kontext:

Die bisherigen Anstrengungen zum Umsteuern in Richtung von Nachhaltiger Entwicklung sind unzureichend. Eine Basisstrategie die Umsteuerung spürbar zu stärken kann darin bestehen, die relevanten Potenziale in den einzelnen Gesellschaften genauer aufzuspüren und in angemessener, erfolgversprechender Weise zu mobilisieren. Im Zuge der zunehmend erfolgenden Transformationsforschungen sollen diese Potenziale in den Fokus genommen werden.

Ansetzend an bisherigen Forschungsergebnissen und Konzepten über verschiedene Management- und Governance-Möglichkeiten verschiedener Gesellschafts- und Governancesysteme gilt es, für möglichst zahlreiche (auszuwählende) Länder zu untersuchen, (a) welche Potenziale dort vorhanden sind, und (b) wie diese mobilisiert werden könnten. Zu (a): das mögliche Spektrum an „Potenzialen" ist eingangs breit anzulegen und je nach administrativer Ebene und Sektor genauer zu klären (auch hinsichtlich „Erforschbarkeit" und „Einschätzbarkeit"). Dabei ist von einer großen Formenvielfalt auszugehen (Projekte, Instrumente, Maßnahmen, Gesetze, Standards, change coalitions, transition arenas u.v.a.m.). Zu (b): das „wie" der Mobilisierung bezieht sich auf die besonders relevanten Akteure/ Akteurskonstellationen („change coalitions"), die erforderlichen Ressourcen (Typen wir Finanzmittel, Recht, Sozialkapital, Legitimation, Macht etc.).

Angesichts bisheriger Erfahrungen mit Nachhaltigkeitsprozessen auf verschiedenen Ebenen wäre im Rahmen eines solchen Forschungsstrangs nicht nur über die Gestaltung verbesserter oder neuer Maßnahmen und Politiken zu arbeiten, sondern möglichst systematisch auch an der Terminierung von Maßnahmen und Politiken (phasing out von erkennbar und nachweislich nichtnachhaltigen Aktivitäten und Praktiken/Verhaltensweisen).
Der zeitliche Horizont sollte einen Zeitraum bis etwa 2030 oder 2040 umfassen, um den zu gestaltenden (bzw. zu beeinflussenden) Transformationsprozessen und –phasen und deren Voraussetzungen gerecht werden zu können (Pfadabhängigkeiten, Eigenzeiten). Hierfür könnten beispielsweise (in partizipativer Weise) Szenarien oder Roadmaps ausgearbeitet werden.

Als inhaltlicher Horizont könnten die derzeit in Ausarbeitung und Definierung befindlichen SDGs herangezogen und ebenfalls hinsichtlich ihrer sukzessiven Verwirklichung eingebaut werden.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Fragen der horizontalen sowie vertikalen Verknüpfung von Nachhaltigkeitsaktivitäten sind seit Jahren in zahlreichen Forschungszusammenhängen in Bearbeitung. Im engeren Bereich der Politikforschung und öffentlichkeitswirksamen Politikberatung gibt es u.a. zwei aktuelle prominente Beispiele: die „Peer Reviews" nationaler Nachhaltigkeitsstrategien (kürzlich die zweite für die deutsche NHS), und die Vergabe des „Future Policy Awards" durch den World Future Council.

Hierfür kann in der deutschen Forschungsgemeinde auf theoretische Konzepte der Transformations- und Governanceforschung, Transition Management, Models of Change, Pfadabhängigkeit und Pfadwechsel, sowie diverser Methoden der wissenschaftlichen Zukunftsforschung zurückgegriffen werden. Dazu sind jeweils unterschiedliche Institutionen und Research Communities (und epistemological communities) miteinander zu vernetzen und zu aktivieren.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Insofern es in diesem Forschungsthema um das Auffinden und das Zugänglichmachen von Potenzialen und deren Mobilisierung für eine Nachhaltige Entwicklung geht, kann ein gewisses Interesse bei zahlreichen Akteuren einer Gesellschaft vorausgesetzt werden. Angesichts allgemein „knapper Ressourcen" wäre das Aufspüren von Potenzialen für viele Länder und Institutionen interessant. Für die Realisierung eines solchen Projektes lassen sich Anschlussmöglichkeiten innerhalb der internationalen Community wie z.B. UNEP aufbauen.

Besonders beachtet werden müssen bei einer Internationalisierung die gerade in Bezug auf Transformation und Governance ganz erheblichen Differenzen der verschiedenen Gesellschafts-, Wirtschafts- und Regierungssysteme, insbesondere z.B. die jeweiligen „politischen Kulturen" und deren Wandel.

Fossil-fuel subsidies: measuring impacts and governing reform

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Short presentation of the theme idea in the Future Earth context:

There is widespread agreement that the transition to sustainable energy systems, away from conventional fuels, is necessary if we are to reduce the impact of climate change. Yet, this transition, unprecedented in scale and scope, is characterised by complex (system) dynamics, interdependencies, and high levels of uncertainty. Energy systems are deeply entrenched in our economy, consumption as well as production patterns, regulations and infrastructure. Disrupting them affects a wide range of actors, many of which actually seek to frame decisions in ways that promote their own goals. The lock-in to current energy systems, based upon existing infrastructure and established patterns of activity, is amplifying the influence precisely of those most resistant to change. At the same time, particularly in developing countries, the challenge of transitioning to sustainable energy systems is compounded by the need to ensure that this process providing socio-economic benefits to the population at large.

Fossil-fuel subsidies are one of the main barriers to enabling the shift to more sustainable energy sources, reason why reform is a precondition for enabling the energy transition (GSI 2012, WB 2012, IMF 2013). Maintaining the current fossil-fuel subsidy regime is problematic for several reasons. First, fossil-fuel subsidies have become increasingly costly for governments, threatening the economic stability of the energy dependent countries, and detracting other economic and social investments (Bacon & Kojima, 2010). Second, fossil-fuel subsidies are also likely to have encouraged overconsumption of energy, contributing also to higher CO2 emissions (IEA, 2011; IMF, 2011). Third, and critical for energy security and diversification, fossil-fuel subsidies obstruct the deployment of renewable energy and green finance, setting electricity prices artificially low, making it costly for governments and private sector to support renewable energy investments. As fossil fuel prices start to increase on the global market, these effects are exacerbated. By postponing action, policy makers are wasting valuable fiscal resources, engaging in regressive policies and missing opportunities for transforming the energy system.
Exploring the reform of fossil-fuel subsidies is pertinent because this process is characterised by dynamics of complex, coupled, multi-scale systems, that at the same time need to respond to concerns for equity and wellbeing of vulnerable population groups. This suggests that to enable reform, managing different interests (of the state, business sector, civil society) that shape and constrain change is necessary.

We consider several questions relevant for further exploration:

- What is the impact of fossil-fuel subsidies on the large economy, on private sector competitiveness, and consumers?
- What is the most optimal way to target fossil-fuel subsidies and reallocate savings towards supporting renewable energy development?
- How to mitigate negative impacts on the most vulnerable population groups? What types of compensation schemes are suitable in different contexts?
- How can reform be enabled and effectively governed?
- What factors contribute to leading such reform in a politically and socially acceptable way?

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

Germany is one of the largest supporters of green growth and energy transition both at national level as well as abroad. However, for its energy transitions programs (domestically and internationally) to be effective, reforming fossil-fuel subsidies is critical. Hence, German policy-makers (as well as academics) need a better understanding both of the impacts that fossil-fuel subsidies have, as well as the complex political economy that constraints reform.

This research agenda calls for collaboration of economist and political scientists. Also other social sciences as behavioral psychology and sociology can add value to a joint research project, especially to all aspects related to reforming the existing subsidy systems. Moreover, expertise of researchers from natural sciences could be very helpful to better understand the effects of the use of different fossil fuels on the environment and the state of health of people. There might be fossil-fuels that are especially harmful and others that might be needed for the implementation of new energy efficient technologies. Thus, knowledge about these technical and scientific details might influence the ideal sequencing of fossil-fuel subsidies reforms.

Short description about of the internationalization potential of the suggested theme idea:

Given the size and impact that fossil-fuel subsidies have in both the developed and the developing countries, the potential for internationalizing this theme is large. Efforts towards reform have been made since several decades, but limited progress has been achieved. Yet, wide agreement has been reached on the relevance of reforming and better targeting fossil-fuel subsidies for making progress with the climate change agenda. Reform is critical for freeing up financial resources to be invested in other areas with a higher developmental impact (such as education, health) and that enable the transition to more sustainable energy systems (such as investing in renewable energy). The fact that reform is currently being discussed and supported in forums such as G-20, can be viewed as a testimony to its relevance.

Nachfrage und Angebot nachhaltiger Lebensmittel mit globaler Perspektive

Jing Dai, Claudia Schwirplies, Andreas Ziegler

Kurze Darstellung des Themas im Future Earth Kontext:

Während die Ernährung die wichtigste Grundlage der menschlichen Existenz darstellt, sind gleichzeitig die Produktion, die Verarbeitung, der Handel und der Konsum von Lebensmitteln eine Ursache für sozial-ökologische Probleme. So ist z.B. die Ernährung eines der drei Konsumfelder von Haushalten mit dem größten Einfluss auf die Umwelt. In Bezug auf die Produktion und den Konsum von Gütern werden weltweit die Landwirtschaft und der Lebensmittelkonsum als wichtigste Treiber von negativen Umwelteinflüssen identifiziert, gefolgt von fossilen Energieträgern (z.B. UNEP, 2010). Aus Sicht einer nachhaltigen Entwicklung sind neben der Betrachtung der Umweltwirkungen zusätzlich soziale Probleme der Erzeugung und des Handels von Lebensmitteln relevant.

Bisher besteht keine allgemeingültige Definition nachhaltiger Lebensmittel, sondern lediglich Kategorien für einzelne Produkteigenschaften, die unterschiedliche Dimensionen der Nachhaltigkeit ansprechen. Aufgrund dieser Tatsache lassen auch die empirischen Studien über Motive für und gegen den Kauf solcher Lebensmittel einen Großteil nachhaltigkeitsrelevanter Kriterien, wie z.B. Regionalität, Saisonalität oder umweltfreundliche Verpackungen unbeachtet.

Für die Ausweitung nachhaltig erzeugter und gehandelter Lebensmittel (im Folgenden „nachhaltige Lebensmittel“) spielt die Nachfrage aufgrund der Nachfragemacht von Verbraucherinnen und Verbrauchern eine zentrale Schlüsselrolle. Ebenso spielen Maßnahmen der Angebotsseite eine bedeutende Rolle. Zum einen haben Entscheidungen bei der Erzeugung und Verarbeitung von Lebensmitteln sowie des Lebensmittelhandels natürlich direkte sozial-ökologische Auswirkungen. Zum anderen gestalten diese Anbieter als wesentliche Marktakteure nicht nur Lebensmittelproduktionsmuster, sondern beeinflussen auch aktiv entsprechende Lebensmittelkonsummuster.

Aufgrund der relativen Neuartigkeit dieses Forschungsbereichs innerhalb der Umweltökonomik fehlt aus methodischer Sicht bislang ein systematischer Vergleich verschiedener empirischer Ansätze zur Ermittlung der Präferenzen und Zahlungsbereitschaften für nachhaltige Lebensmittel. Darüber hinaus wurden mögliche Interaktionen zwischen der Nachfrage nach nachhaltigen Lebensmitteln und deren Angebot gemeinsam empirisch bisher noch nicht untersucht. Ebenso fehlt bislang eine systematische empirische Analyse politischer Instrumente zur Förderung nachhaltiger Lebensmittel.

Zukünftige Forschungsvorhaben könnten deshalb moderne mikroökonometrische Methoden, wie beispielsweise experimentelle Ansätze, miteinander kombinieren und vergleichend analysieren. Dabei können insbesondere die Nachhaltigkeitswirkungen betrachtet und auf Basis einer vorherigen Definition relevanter Nachhaltigkeitskriterien analysiert werden. Auf dieser Grundlage lassen sich konkrete politische Handlungsempfehlungen sowohl für die Angebots- als auch die Nachfrageseite formulieren. Der Inhalt, die Akzeptanz und Umsetzbarkeit der abgeleiteten Empfehlungen profitieren dabei immens von der transdisziplinären Ausrichtung eines solchen Forschungsvorhabens. Wichtige Vertreter der Lebensmittel-industrie, von Ministerien, Verbraucherorganisationen, Verbänden und NGO können in alle Phasen des Projekts eingebunden werden.

Die Ergebnisse des Projektvorhabens tragen zu einem besseren Verständnis der Treiber und Blockaden des Konsums nachhaltiger Lebensmittel als wichtigen Baustein auf den Weg zu einer nachhaltigeren Wirtschaft bei.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Das Problemfeld nachhaltige Lebensmittel weist ein großes inter- und transdisziplinäres Potential in der Betrachtung und Vorgehensweise auf. Nicht nur agrarwissenschaftliche Kenntnisse über nachhaltigkeits-bezogene Eigenschaften und Auswirkungen der Produktion bestimmter Nahrungsmittel, sondern auch psychologische und soziologische Determinanten des Konsums, wie z.B. Werte, Motive und soziale Normen, spielen eine bedeutende Rolle für eine ganzheitliche Betrachtung. Naturwissenschaftliche Aspekte werden beim Messen und Bewerten der Nachhaltigkeits- und insbesondere ökologischen Wirkungen von Nachfrage und Angebot im Bereich von Lebensmitteln berücksichtigt. Vor allem kann das Projektvorhaben methodisch stark volkswirtschaftlich ausgerichtet sein, insbesondere in Bezug auf den Einsatz verschiedener experimenteller Forschungsansätze sowie mikroökonometrischer Methoden. Die Transdisziplinarität erfolgt insbesondere über die Zusammenarbeit mit und die Einbeziehung der Lebensmittelbranche.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Nachhaltigkeit spielt auf globaler Ebene sowohl für Industrienationen, als auch für Entwicklungs- und Schwellenländer, insbesondere im Lichte des Klimawandels, aber in Hinblick auf die zwischenstaatliche Verteilungsgerechtigkeit, die eine immer bedeutendere Rolle spielt. Sowohl ökologische, ökonomische und soziale Auswirkungen, als auch die Notwendigkeit der Entwicklung von Lösungsansätzen, bilden Herausforderungen, die nicht nur auf internationaler, nationaler und zwischenstaatlicher, sondern auch auf der Ebene von Konsumenten und Unternehmen angegangen werden müssen. Deutschland kann dabei in Bezug auf Nachhaltigkeit eine Vorreiterrolle für andere Staaten und dessen Bevölkerung einnehmen. Aus den Ergebnissen den hier skizzierten Forschungsrahmens lassen sich effektive Instrumente für den Weg zum nachhaltigen Konsum entwerfen, die ggf. über den Ernährungsbereich hinaus auf andere Bereiche sowie andere Länder anwendbar sind, um Verbraucher gezielter über nachhaltigen Konsum und nachhaltige Produkte und Dienstleistungen informieren zu können und die Nachfrage nach diesen Produkten und Dienstleistungen zu fördern.

Impact Assessment for Sustainable Development – A Vision for the Future

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Short presentation of the theme idea in the Future Earth context:

Impact Assessment (IA) of planned policies has evolved as a standard requirement in the OECD world and well beyond to inform decision-making before policies are agreed. It intends to improve the quality of policies by minimizing unwanted side-effects and maximizing social benefits. Increasingly, it is considered and applied as a tool to support the evidence basis of policy making for sustainable development. As such it is a venue for interaction between science and policy making.

The general picture of IA practice, however, shows a gap between the proliferation of IA knowledge and tools from the scientific community and their actual use in the policy process. Existing knowledge and tools are often not used, and direct interaction between science and policy is limited.

In recent years, a large number of research projects have been funded by various sources to facilitate impact assessment and evidence based policy making. However, the uptake of the research findings has not met the expectations. Knowledge needs of policy makers are typically fulfilled by means of contracted consultancy while the wider research reservoir remains underutilized.

The EU FP7 Network of Excellence LIAISE is designed to better bridge between research and policy making in the field of Impact Assessment for sustainable development. It has developed several products and services to facilitate the interaction. The mission is to better contextualize knowledge in the process of policy making and thereby to improve the relevancy of scientific findings. The activities of LIAISE include:

- Development of a shared research agenda: Policy makers and researcher identify jointly mid- and long term research needs
- Co-Design of knowledge and in particular models for impact assessment
- Describing and clustering of knowledge in the context of impact assessment for sustainable development in a shared toolbox
- Development of standards and processes to ensure the quality and relevancy of evidence in the context of impact assessment

LIAISE brings together a community of researchers and research institutes (including UFZ, ZEW, ZALF, University of Bonn, FU Berlin) from various disciplines (economists, natural scientists, political scientists and IT science) to form a durable network in the field of Impact Assessment for Sustainable Development. The co-design of knowledge and transdisciplinary inquiry is considered as key success factor in research projects conducted in the context of the LIAISE network. The network has established and institutionalized close contacts with practitioners from policy making and civil society throughout Europe.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

A lively interaction between the different disciplinary communities and between scientific and practitioners' communities involved in the production and use of IA knowledge and tools for sustainable development is essential. This holds true for both natural and social science which both can make important contributions to IA for SD, from their respective perspectives.

LIAISE already brings together a community of researchers and research institutes (including UFZ, ZEW, ZALF, University of Bonn, FU Berlin) from various disciplines (economists, natural scientists, political scientists and IT science). The German Future Earth Summit 2014 is an important opportunity to inform other research groups about the LIAISE approach to bridging the gap between science and policy and to invite their participation. Their feedback and views on possible next steps in the further integration of the IA research community are highly valued, as well as their interest to become involved in this process.

Short description about of the internationalization potential of the suggested theme idea:

Impact assessment has been institutionalised and is practiced in all OECD countries and beyond. Further qualification of IA knowledge and tools for sustainable development and their use in policy making is however still needed. For this reason, the topic is not specific to the German (or European) context but of high interest for all countries employing impact assessment for sustainable development.

Deutsches Sustainable Low Carbon Society Research Network (LCS-R-Net)

Dr. Stefan Lechtenböhmer, Prof. Dr. Manfred Fischedick,
Wuppertal Institut für Klima, Umwelt, Energie

Kurze Darstellung des Themas im Future Earth Kontext:

Der Vorschlag der Gründung eines deutschen Netzwerks zur Erforschung einer Sustainable Low Carbon Society in einer Vernetzung von Wissenschaft, Politik und Gesellschaft baut auf dem bereits seit 2008 unter deutscher Beteiligung existierenden LCS-RNet (www.lcs-rnet.org) auf.

Die offiziellen Ziele des Netzwerks, die bereits durch den G8-Umweltminister-Beschluss 2008 in Kobe vorstrukturiert sind, sind die Förderung und Initiierung von 1. Informationsaustausch und Forschungskooperation zwischen den Wissenschaftlern, mit dem Ziel eine „LCS-Community" zu etablieren, 2. internationaler Dialog und gegenseitiges Lernen zwischen Wissenschaft, Politik und Gesellschaft (stakeholder) sowie 3. Inputs und Empfehlungen für die internationale Klimapolitik." Das LCS-R-Net bildet daher heute schon eine idealtypische Co-Design- und Co-Production Plattform für nationale und internationale Low-Carbon-Strategien.

Aus deutscher Sicht sind diese Ziele richtig und können für die deutsche Situation weiter spezifiziert werden. Die Koordination der deutschen Beteiligung am LCS-R-Net liegt derzeit bei BMU und Wuppertal Institut. Das LCS-Netzwerk kann genutzt werden, um die existierende starke deutsche Forschungslandschaft zum Thema weiter zu entwickeln und stärker international zu vernetzen. Hierüber können verstärkt deutsche Positionen und Strategien über den Dialog in die internationale Diskussion eingebracht werden. Das Netzwerk bietet dazu einen zusätzlichen Kanal, neben den offiziellen Verhandlungen. Aus Deutschland können insbesondere die im Rahmen des Transformationsprozesses der Energiewende zahlreichen und vielfach konzeptionell und in der Umsetzung deutlich über das international Übliche heraus ragenden realen Umsetzungsexperimente und ihre wissenschaftliche Begleitung im gesellschaftlichen Diskurs eingebracht werden.

Gerade die - schon im internationalen LCS-RNet-Netzwerk angelegte – Kombination aus direkter Regierungsbeteiligung und offenem wissenschaftlichem Netzwerk wird als Neuerung und als wesentlicher Vorteil des Netzwerks gesehen und sollte daher aktiv ausgebaut werden. Hier geht das Netzwerk klar über die engen Grenzen eines traditionellen Wissenschaftsverständnisses hinaus und hier kann es im Sinne einer „Koproduktion" gesellschaftlich und politisch relevanten Wissens auch im Sinne des WBGU (Große Transformation) seine größte Wirksamkeit generieren.

Um dies zu ermöglichen, sollte eine geeignete Aufgabenteilung zwischen Politik und Wissenschaft auch im Rahmen des für ein deutsches Netzwerk zu schaffenden Organisationsmodells angestrebt werden. Die Wissenschaft sollte möglichst frei und inklusiv ausgestaltet sein, um breites und hochwertiges Wissen zu generieren. Die politische Seite sollte dies im Sinne von „Fordern und Fördern" aktiv fördern, durch eine aktive Benennung relevanter Fragestellungen aber gleichzeitig auch durch Gestaltung und Förderung entsprechender Strukturen die eine wissenschaftliche Beantwortung auf höchstem Qualitätsniveau ermöglichen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

In Deutschland bestehen breite Communities nicht nur in Natur- und Gesellschaftswissenschaften sondern auch in Politik und Zivilgesellschaft, die sich intensiv mit Fragen der Transformation unserer Gesellschaft hin zu einer „Sustainable Low Carbon Society „auseinander setzen. Zu nennen sind hier beispielhaft die Arbeiten des WBGU, sowie zahlreiche universitäre und außeruniversitäre Forschungseinrichtungen aus allen Fachrichtungen wie z.B. die Plattform Energiewende der großen Forschungsgemeinschaften, die Institute des ECORNET oder der NAWIS-Runde. Aus der Zivilgesellschaft sind u.a. die Gruppe der Umwelt- und Entwicklungs-NGO's aber auch Kirchen und Gewerkschaften in der Thematik sehr aktiv.

Für alle diese Akteure ist eine internationale Vernetzung ihrer Aktivitäten unter dem besonderen Aspekt der „Koproduktion" hoch relevant, um ihre Erkenntnisse in den großen Rahmen der globalen Transformation einbringen zu können und gleichzeitig Unterstützung und inhaltliche Anstöße aus der internationalen Diskussion zu erhalten.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Durch die Verknüpfung des Vorschlags mit einem bereits bestehenden internationalen Netzwerk ergeben sich gute Möglichkeiten einer Internationalisierung. Bestehende Institutionen und Prozesse, wie z.B. Jahreskonferenzen, Workshops, Veranstaltungen auf den COPs sowie Jahresberichte an die G8/G20 Umweltminister stehen für eine Mitarbeit interessierter deutscher WissenschaftlerInnen und PolitikerInnen offen. Es ergeben sich zudem zahlreiche thematische Vernetzungsmöglichkeiten auch mit anderen Aktivitäten z.B. der IRENA oder der IEA sowie des IPCC (WG3) in diesem Themenfeld.

Neue Wohlstandsmodelle als systemische Innovationen

Dr. Maja Göpel, Dr. Philipp Schepelmann, Dr. Holger Berg,
Prof. Dr. Uwe Schneidewind / Wuppertal Institut für Klima, Umwelt, Energie

Kurze Darstellung des Themas im Future Earth Kontext:

Der Diskurs um ein „neues Paradigma für Entwicklung" findet aktuell besonders auf der Ebene die Vereinten Nationen statt und soll dort bis 2015 als Rahmen und Zielbeschreibung für neue globale Nachhaltigkeitsziele (SDG/MDG-Prozess) gesetzt werden. Einer der zentralen Streitpunkte in diesem Kontext rankt sich um die Rolle von Wirtschaftswachstum wie es konventionell als BIP gemessen und als überragendes Entwicklungsziel verfolgt wird. Die Diskussion um ein neues Paradigma „Beyond GDP" kommt der Hinterfragung des hegemonialen Status' einer bestimmten Form von Entwicklung und der darin denkbaren Lebensräume, sozialen Praktiken und Wohlstandsmodelle gleich.

Aus Perspektive systemischer Innovationen birgt dies enorme Potentiale für Transformationen in Richtung Nachhaltigkeit: Es geht um die Neubestimmung einer Weltsicht (von „Narrativen"), aus der das Design von Zielen, Maßnahmen und Indikatoren erfolgt. In ihr manifestieren sich Deutungshoheiten, Praktiken und Musterlösungen („Exempel" nach Thomas Kuhn). Ein Paradigmenwechsel in Wohlstandsverständnis und Entwicklungsziel ist damit ein sehr wichtiger Hebelpunkt, um von adaptiver Systemeinhegung (was viele der Effizienzstrategien sind) zu systemischen Innovationen der Wertschöpfungsketten zu wirken, die neue dynamische Gleichgewichte schaffen (s. Meadows 1999, GEO5 Report UNEP)

Aus Sicht der Transition Forschung bietet deshalb die Arbeit zu Indikatoren, Messinstrumenten, Zielen und Szenarien eines „neuen ökonomischen Paradigmas" das Potential, makroökonomische Veränderungen als das Ergebnis von systemischen Innovationen mittlerer und lokaler Reichweite in lokalen/regionalen Wohlstandsmodellen und unternehmerischen Wertschöpfungsketten zu denken und zu koordinieren (siehe Berkhout et. a. 2009: 225) ohne ein erstickendes „Grand Design" durchsetzen zu wollen.

Als Richtgröße für Transformationspfade hin zu neuen Wohlstandsmodellen kann das Prinzip einer „doppelten Entkopplung" dienen: Es gilt menschliche Bedürfnisse und Lebensqualität multidimensional zu definieren und die wirtschaftlichen Strategien zu deren Erfüllung so weit wie möglich von der Umweltnutzung abzukoppeln. . Transdisziplinäre Forschungsfragen diesem Sinne sind dann z.B.:

1. Reflexive Governance durch Indikatorenprozesse (analog mehrerer FP7 Forschungsprojekte):
• Wie kann die Verankerung neuer Indikatoren für abgestimmtes Regieren über multiple Ebenen hinweg oder Lernprozesse für politische Gestaltung durch Peer-Vergleiche genutzt werden? Was sind die Erfahrungen mit alternativen Wohlstandsindikatoren in unterschiedlichen Ländern?
• Welches Design von Indikatoren-Prozessen begünstigt konstruktive Verständigungsprozesse über Unterschiede in Weltanschauungen und Interessen? Was kann aus der Wohlstands-Enquete Kommission im Bundestag gelernt werden sowie aus erfolgreichen Prozessen in internationalen Kontexten?

2. Strategisches Nischenmanagement für neue Wertschöpfungsketten (analog der aktuellen BMBF Green Economy Ausschreibung):
• Welche Pioniere der Privatwirtschaft und Zivilgesellschaft setzen heute bereits Geschäftsmodelle im Sinne ganzheitlicher Wohlstandsmodelle um und welchen Hemmnissen in deren Aufrechterhaltung und Verbreitung sind sie ausgesetzt?
• Welche Finanzierungsprobleme erfahren Pioniere ganzheitlicher Wertschöpfung wie z.B. auch sozialer Innovationen und welche Standards und Normen der Risiko und Return on Investment Kalkulationen sind hier ausschlaggebend? Welche institutionellen

Lösungen könnten hier moderierend und damit investitionsfördernd wirken?
3. Modellierung strukturellen Wirtschaftswandels (analog SIMRESS aus BMU/BMWi, Fullstaff und GEMMA von Tim Jackson und Peter Victor im Rahmen von INET)
• Welche Anreizpakete und Regulierungen würden z.B. das Ziel einer Kreislaufwirtschaft mit dem Anspruch neuer Wohlstandsmodelle verbinden und Ressourcenproduktivität mit neuen Geschäfts- wie Investitionsmodellen und Konsummustern zusammen bringen?
• Welches Verständnis von Wettbewerbsfähigkeit kann einen tieferen Strukturwandel für die Verbreitung von doppelter Entkopplung und nachhaltiger Wertschöpfung begleiten? Welche strukturellen Pfadabhängigkeiten und Regulierungen müssten dafür angepasst werden und wie können die Auswirkungen modelliert werden?

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Der Diskurs um neue Wohlstandsmodelle findet auf unterschiedlichen Governance-Ebenen statt. Beispielsweise wollen die Vereinten Nationen bis 2015 einen narrativer Rahmen und Zielbeschreibung für neue globale Nachhaltigkeitsziele entwickeln. Die OECD bemühen sich um einen „Better Life Index" und die EU um eine Wohstandberichterstattung „Beyond GDP". Der Deutsche Bundestag hat sich mit seiner Enquete „Wohlstand, Wachstum, Lebensqualität" umfassend mit dem Thema beschäftigt, was auch in der Koalitionsvereinbarung zur Bildung einer neuen Bundesregierung Niederschlag gefunden hat. Neben nationalen Diskursen arbeiten auch in den Bundesländern und auf kommunaler Ebene zahlreiche staatliche und regierungsunabhängige Netzwerke und Gremien zu diesem Thema.

Eine Forschungs-Community für Arbeit an neuen Wohlstandsmodellen hat sich in Deutschland erst in Ansätzen etabliert. Sie existiert nur lose gekoppelt über einzelne Forscherinnen und Forscher an ausgewählten Instituten und Hochschulen. Future Earth bietet die Möglichkeit der stärkeren Vernetzung der deutschen Community in sich sowie mit in den letzten Jahren entstandenen internationalen Ansätzen. Auch die intensive Verbindung mit vielfältigen internationalen praktischen Umsetzungen stehen aus: So arbeiten weltweit ein große Zahl an Ländern und Bundesstaaten mit alternativen Wohlstandsmaßen und angepassten Politik-Designs. Immer mehr globale Unternehmen richten ihre Unternehmensstrategien auf sich verändernde Wohlstandsmodelle aus. Hier ergibt sich ein erhebliches Potenzial für Strategien des „Co-Designs" und der „Co-Production" von Wissen.

Die Forschung zu neuen Wohlstandsmodellen und Systemtransformationen umfasst insbesondere ökonomische, sozial-, kulturwissenschaftliche und technologische Dimensionen. Die ökologischen Rückkopplungen (z.B. im Rahmen von ökologischen Problemverschiebungen) alternativer Strategien erfordern aber eine enge Vernetzung mit naturwissenschaftlicher Forschung.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Forschungsbezüge zu alternativen Wohlstandsmodellen und daran orientierten Systemtransformationen bestehen im europäischen Raum, im Kontext alternativer Thinktanks sie dem „Institute für New Economic Thinking" (INET) europäisch und global. Zudem wird von Seiten UNEP, UNECE und der OECD an Indikatorenentwicklung geforscht (siehe z.B. How's Life Report 2013) sowie in mehreren Programmen auf europäischer Ebene" (in FP7 und JPI).

The political dimension of designing and adapting institutions for sustainable transformation

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Short presentation of the theme idea in the Future Earth context:

Social-ecological transformation requires innovation in governance. In order to generate insights into how to design sustainable transformation processes, guide the development of new forms of governance, and/or adapt existing institutions, the theme focuses on the political dimension of institutional design processes. It looks specifically at stakeholders and actors, their engagement, interests, and their ability to account for contextual variations of ecological conditions, socio-cultural needs, power structures and institutional interactions concerning transformation needs and objectives, from the past to the future.
Conceptually, the theme utilizes insights from governance, institutional policy analysis and socio-ecological systems research (e.g. Benz 2004; Kooiman 2003; March and Olsen 1996; March 1989; Newig and Voß 2010; Ostrom 1990; Scott 2008; Young 2002, 2008, 2010).

Both the needs for transformation and its guiding institutions are subject to interpretation and products of social construction (e.g. Hagedorn 2002; Lascoumes and Le Gales 2007; Paavola et al. 2009). They are constructed with regard to what is deemed to be useful for society, and in respect of how to coordinate practice – not just by reflecting the materiality of the resource basis, but also social institutions and mental models of its users. Institutional designs contain particular, often path dependent problem definitions, interpretations of cause and effect, characterizations of knowledge and information considered as relevant or not to a policy issue. All of these factors are determined at certain times by the actors involved (Schneider and Ingram 1993, 1997, 2005; Schneider and Sidney 2009). Creating or adapting institutions for sustainable transformation is not only about providing information on global problems, ecosystem dynamics and priorities, but also about human interactions and motivations that depend on them (Vatn 2005, 2009). In a multi-agency context, sustainable transformation and governance of socio-ecological systems require extensive information from those actors concerned and their values, of interpretations of problems and solutions, and struggles over needs and demands on different governance levels. This should go beyond narrow circles of experts and decision-makers, but include a wider variety of societal perspectives. Studying actors' interests and motives in a transformation system from the past to the present then forms the basis to initiate an informed, coordinated and reflexive institutional design process for the future. Overarching the analysis is the assumption that institutional design takes place in co-evolution, where actors, institutions and context mutually shape each other.

The idea for the interactive modulation of institutions for sustainable transformation opens the possibility of considering societal actors as strategic thinkers for transformation objectives and their needs for particular institutional design and governance forms. The challenges are to deal with uncertainty, diversity and reconcile conflict among actors who differ in values, interests, and power. Therefore a "Foresight" approach will be conceptualized, being based on the historical findings of actors' interests, path dependencies and transformation mechanisms that enable the anticipation of future institutional developments and impacts. Ambivalences, risks and chances are then discussed with heterogeneous sets of actors in transition arenas. The idea is to investigate the political arrangements of institutions that enable/hinder their sustainable working in reality.

With this, the theme seeks to increase the reflexivity for the formulation of sustainable institutions and design of transformation processes. Methodological bridges shall be offered for a broad range of perspectives to engage actively in discourse with societal transformation and its coordination for its societal acceptance.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

A focus on the design process and capacity of institutions for sustainable transformation – by analyzing the various interdependencies of actors and organizations involved – relates to a common research interest of the German research communities dealing with sustainable transformation (e.g. Newig and Voß 2010; Newig 2011; Schneidewind and Scheck 2012; Voss et al. 2006; Voß et al. 2007). In a similar vein, this theme incorporates a strong inter- and transdisciplinary orientation. On a theoretical-analytical dimension, institutional design processes and their capacity to take stakeholder values, concerns and context particularities into account need to be analysed in an interdisciplinary way, including social and political sciences, as well as ecological, economic and complex system research. On a methodological dimension, transdiciplinary methods for participatory and reflexive ex-ante institutional assessments are to be developed.

Strengthening the socio-political dimension in an otherwise technological, ecological or economic oriented discourse supports institutional learning and adaptation. Such insights can help research disciplines to gain knowledge on the social dynamics of transformation processes, and increase their reflexive capabilities (cf. Schneidewind 2013).

Short description about of the internationalization potential of the suggested theme idea:

Generating knowledge about the political dimension and the social dynamics of institutional design processes that help support socio-ecological transformation bears high potential for internationalization. A number of studies have shown how blue-print approaches have failed to embrace sufficiently the diversity of local settings and the complexity of socio-ecological systems, leading e.g. to poor natural resources management and environmental degradation (e.g. Galaz et al. 2008; Ostrom 2007, 2011). In addition, ignoring dominant structures and actors that become subjects of transformation may lead to blockages and conflict (Schneidewind and Scheck 2012; Wissenschaftlicher Beirat Globale Umweltveränderungen 2011). Instead, these studies suggest that attention needs to be paid to the variety of system attributes, especially those that provide incentives and guide the actions of actors (Ostrom 2007; Hagedorn 2002, 2008, Diez et al. 2003).

While in particular ecological assessments of policy impacts on ecological systems, flows and functions often accomplish institutional design, a systematic assessment of the political and cultural dimension is underrepresented in such design processes (cf. DeCaro and Stokes 2008; Jordan 1999; Jordan et al. 2005). However, appropriate institutions will increase the likelihood of achieving transformation objectives, i.e. they increase the degree of sustainable compliance of the actors, as well as a change of behavior. Thus, studying the political and cultural impacts on and of institutional design in a historical manner is of utmost international relevance, as it demonstrates which interests and objectives exist in various contexts, which have been taken up and which have been left out, and how these are challenged over time. Underlying innovation mechanisms and patterns can be thus identified.

These insights then serve as a basis to initiate an informed, future-oriented design discourse in the form of a foresight process, where actors can discuss future institutional developments, design and adjustment needs that build on past dynamics. Such a methodological contribution help designing and guiding transformation processes. It is of international relevance, as it supports reflexive work towards sustainable, societally embedded institutions. This would also ensure that an ex-post transformation failure and secondary repair work are avoided.

Welche Rolle kann Citizen Science bei der Transformation zu einer nachhaltigen Gesellschaft spielen?

Vohland, Katrin; Bonn, Aletta; Feldmann, Reinart; Liebenau, Lisa; Premke-Kraus, Matthias; Settele, Josef; Vogel, Johannes; Weißhuhn, Karoline

Kurze Darstellung des Themas im Future Earth Kontext:

Mit dem globalen Forschungsprogramm „Future Earth" wird die Forderung nach stärker integrativer und letztlich auch transdisziplinärer Forschung umgesetzt, die in verschiedenen Foren seit Jahren diskutiert wird. Die Veränderungen im Erdsystem und damit auch die Lebensqualität von Menschen wird zunehmend im Kontext verschiedener Ursachenkomplexe untersucht - neben naturräumlichen Gegebenheiten sind dies die verschiedenen gesellschaftlichen Systeme, Werte und Wirtschaftsweisen, die globale Energie- und Stoffkreisläufe prägen. Von Seiten der Wissenschaft sind viele Zusammenhänge zwischen beispielsweise Veränderungen des Klimasystems und den Lebensbedingungen bekannt. In der Bevölkerung dagegen sind viele Zusammenhänge unklar, oder den systemimmanenten Unsicherheiten wird mit „die Wissenschaft weiß es auch nicht" bis hin zur einer Wissenschaftsskepsis begegnet. Das heißt, dass oft ein grundlegendes Verständnis von wissenschaftlichen Prozessen, aber auch ökologischen Zusammenhängen, fehlt.

Neben Bildungszielen könnte die intensivere Einbindung von Bürgerinnen und Bürger in wissenschaftliche Prozesse verfolgt werden und im Rahmen der Umweltforschung dazu beitragen, das Verständnis für Wissenschaft in der Bevölkerung zu verbessern, indem eigene Ideen und vor allem Daten durch die Bürgerinnen und Bürger eingebracht werden können und durch ein damit erhöhtes „Ownership" zur Umsetzung der Erkenntnisse (globaler) Umweltforschung beitragen können.

Es gibt in Deutschland bereits eine Reihe von Citizen Science Aktivitäten im Bereich der Umweltforschung. Aktuell findet, unterstützt durch das Bundesministerium für Bildung und Forschung (BMBF), eine stärkere Vernetzung der Akteure statt, um im Rahmen einer Plattform sowohl die Bürgerwissenschaften zu stärken als auch den Prozess wissenschaftlich zu begleiten. Zum einen sollen die Initiatoren von Citizen Science Projekten bei der Entwicklung und Durchführung von Projekten unterstützt werden. Das betrifft beispielsweise Fragen der Datenqualität und - nutzbarkeit, aber auch das Design von Projekten und Anerkennungsoptionen für die Beteiligten. Zum anderen sollen Bürgerinnen und Bürger über Beteiligungsmöglichkeiten informiert werden, über gezielte Kampagnen, aber auch über eine Webseite, auf der Informationen zu verschiedenen Projekten nach unterschiedlichen Kriterien filterbar sind, z.B. nach Fragestellung, Wohnort oder Aufwand.

Eine entscheidende Frage wird die Evaluierung solcher Projekte im Hinblick auf die Rolle von Citizen Science bei der Transformation zu einer nachhaltigen Gesellschaft sein. Wie ernsthaft und innovativ setzt sich das Wissenschaftssystem mit den Fragen und Werten der Bürgerinnen und Bürger auseinander, nimmt es die Beiträge von Citizen Scientists an? Und es wird untersucht, was sich an Systemen zur Anerkennung wissenschaftlicher Leistungen ändern müsste, damit die Einbindung von Citizen Science dazu führt, dass die Ergebnisse der Transformationsforschung, der globalen Umweltforschung in nachhaltigere gesellschaftliche Praktiken umgesetzt werden.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Große Teile der deutschen Forschungscommunity sehen ein wichtiges Potential im Ausbau von Citizen Science Aktivitäten. Die stärkere Einbindung von Bürgerinnen und Bürgern dient durch ein verbessertes Verständnis wissenschaftlicher Prozesse der höheren Akzeptanz sowie einer verbesserten Implementierung der Ergebnisse. Allerdings hapert es in der Praxis oft an mangelnden Ressourcen. Um Bürgerinnen und Bürger sinnvoll einzubinden, bedarf es eines entsprechenden Forschungsdesigns, Standards zur Datenerhebung und -verarbeitung sowie angemessener Rückkopplungssysteme zwischen wissenschaftlichen Einrichtungen und Citizen Scientists. Um dies zu gewährleisten, sind sowohl personelle als auch finanzielle Ressourcen notwendig. Dafür kann es aber möglich sein, Fragestellungen zu bearbeiten, deren zeitlicher und räumlicher Umfang die Möglichkeiten einzelner Einrichtungen oder Projekte weit übersteigt. Beispiele gibt es in der Biodiversitätsforschung, bei der das Helmholtz-Zentrum für Umweltforschung (UFZ) in jahrelanger Arbeit ein durch geschulte Ehrenamtliche durchgeführtes Schmetterlingsmonitoring aufgebaut hat, welches wissenschaftlichen Ansprüchen genügt und die Veränderungen in Schmetterlingsgemeinschaften aufgrund von Klimawandel oder Landnutzung analysiert.
Während viele Citizen Science Projekte, die der Global Change Forschung zugerechnet werden können, primär naturwissenschaftlich ausgelegt sind, besteht ein großer wissenschaftspolitischer und -soziologischer Forschungsbedarf im Hinblick auf Governance und Impakt. Während es bereits einige Studien zur direkten Evaluierung und den Lernerfolgen der beteiligten Citizen Scientists gibt, stehen übergreifende Studien zur Veränderung des Wissenschaftssystem aufgrund der verstärkten wissenschaftlichen Einbindung von Bürgerinnen und Bürgern noch aus. Diese sind aber wichtig, da die Ergebnisse der Transformationsforschung letztlich nur über breite gesellschaftliche Prozesse umgesetzt werden können. Citizen Science ist sicherlich nicht die einzige Möglichkeit, im gesellschaftlichen Raum stärker wissenschaftsbasiert zu argumentieren, aber eine wichtige und vielversprechende.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Parallel zu den Aktivitäten in Deutschland, die zu einer stärkeren Vernetzung der Akteure und damit zu einem intensiveren Austausch im Hinblick auf best practice führen, organisieren sich auch auf europäischer Ebene Einrichtungen im Rahmen der European Citizen Science Association (ECSA). Ziel ist es, gemeinsam mit Bürgerinnen und Bürgern Forschungsprojekte zur nachhaltigen Entwicklung durchzuführen.
Die Organisation im Rahmen von ECSA erlaubt es zudem, grenzüberschreitende Fragestellungen beispielsweise zu den Auswirkungen des Klimawandels, zu den Möglichkeiten einer ökologisch ausgerichteten Gemeinsamen Argarpolitik (GAP) oder zur Luftverschmutzung zu bearbeiten. Neben einem intensivierten Verständnis sowohl von wissenschaftlicher Arbeit als auch zu den spezifischen Themen fördert ECSA die europäische Identität.
Im Rahmen des europäischen Forschungsprojektes EU BON (Building the European Biodiversity Observation Network) wird untersucht, in welcher Form und Qualität die Daten von Bürgerforscherinnen und - forschern am effektivsten in Daten eingespeist und auch zur weiteren Verwendung zur Verfügung gestellt werden können. Hier ist eine enge Kommunikation mit deutschen Akteuren wichtig, um durch das Setzen von Standards eine größtmögliche Nutzbarkeit der Daten zu erzielen.
Einen intensiven Austausch gibt darüber hinaus auf internationaler Ebene. Gerade die Akteure in den USA haben jahrelange Erfahrung nicht nur mit der Datenqualität, sondern auch mit den verschiedenen Möglichkeiten, Bürgerinnen und Bürger anzusprechen und auch emotional an den Forschungen zu beteiligen.

Can we use our experience from 1989 to meet future challenges?

Susan Scharwiess

Short presentation of the theme idea in the Future Earth context:

Can we use our experience from 1989 to meet future challenges?

Everyone over 35 from Berlin, surrounding areas of Germany, and neighboring areas to the East, has experienced a major process of social transition. Almost everyone was surprised and many were overwhelmed by some aspect of the process. While it was not a deliberate transformation, much more a sense of being in free fall, and nowhere near as complex or as fraught with danger as the Anthropocene challenge, this process affected our values, beliefs, and worldviews, our individual and collective behavior, our lifestyles, trade, production and consumption.

One way to access this experience could be through the work of Systems in Transition, an international network of Systemic Family Therapists, Group Psychoanalysts, and other mental health professionals who came together in 1992 to understand and deal with problems we saw in our clients and felt in ourselves. We sensed a possible solution in sharing our experience and in comparing social processes to family processes. Every year, we meet in a different country to share around a theme such as Orientational Crises, Identity, Power and Leadership, or Women and Men.

After seven years, I collected the major themes from our individual reports on the meetings:
1. Overload - in work/in perception - high expectations/aggressive disappointment
2. Unification Differentiation + Regression De co operation (Autonomy)
3. Identity (working through the past): Mine or Ours?
4. Responsibility (Power) vs. Fate, or Opposition?
5. Complexity and Chaos

These arranged themselves into a diagram which reflects the transitional process.

Might this description stimulate hypotheses and research approaches among the Workshop participants?

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

No matter what specific research design might be used, the German experience after 1989 offers a wealth of avenues to explore psychological and behavioral dimensions of dealing with thransition.

Short description about of the internationalization potential of the suggested theme idea:

Aside from the related but differently-accentuated experience of neighboring countries, an internationally organized research group would offer an opportunity to reflect on the experiential dimensions of the approach.

Urbane Reallabore

Prof. Dr. Uwe Schneidewind, Dr. Manfred Fischedick, Prof. Dr. Lechtenböhmer, Dr. Ralf Schüle, Dr. Daniel Vallentin, Dr. Johannes Venjakob / Wuppertal Institut für Klima, Umwelt, Energie
Prof. Dr. Daniel Lang/Leuphana Universität Lüneburg

Kurze Darstellung des Themas im Future Earth Kontext:

Angesichts der dynamischen Zunahme der in Städten lebenden Menschen (heute 50%, bis 2050 vermutlich bis zu 80% der Menschheit) werden sich die Herausforderungen ökologischer, gesellschaftlicher und ökonomischer Transformationen insbesondere im urbanen Kontext zeigen. Deswegen lässt sich aktuell eine starke Hinwendung der Global Change-Forschung zum Thema Stadt beobachten.
Urbane Transformationsprozesse als Untersuchungsobjekt gehen dabei auch mit methodischen Herausforderungen einher: Die Analyse und Mitgestaltung von komplexen Systemtransformationen von und in Städten erfordern ein hohes Maß an interdisziplinärer Kooperation sowie den starken Einbezug des Kontextwissen von Praxisakteuren der Stadtgestaltung (d.h. von Politik, Verwaltung, Planern, Wirtschaft, Zivilgesellschaft, ...). Solche inter- und transdisziplinären Formen der Wissensintegration stellen an die Wissenschaft erhebliche methodische und institutionelle Herausforderungen: Es bedarf u.a. interdisziplinär anschlussfähiger Formen der Systembeschreibung und –modellierung, komplexe Labor- und Experimentierdesigns zur Beobachtung und Analyse urbaner Transformationsprozesse sowie Wissenschaftlerinnen und Wissenschaftler als auch wissenschaftlicher Institutionen, die über methodisches Wissen und Erfahrung in inter- und transdisziplinärer Wissensintegration verfügen.
Insbesondere die Erweiterung des „Labor-" und „Experimente"-Begriffs hin zu „Städten als Reallaboren" steht in Verbindung mit einem allgemeinen „Experimental Turn" in der Ökonomie- und in den Sozialwissenschaften (vgl. u.a. Overdevest u.a. 2010). Insbesondere durch Laborexperimente ist es zu einer empirisch fundierten Erweiterung der Verhaltensannahmen von Akteuren gekommen und hat diese Disziplinen in ihrer Aussagekraft noch mächtigergemacht. Es zeigt sich immer deutlicher, dass ein solcher „Experimental Turn" auch bei der Analyse komplexer sozio-technischer Veränderungsprozesse notwendig ist. Die Herausforderung besteht darin, dass die klassische kontrollierte Labor- und Experimentsituation zu „Realexperimenten" und „Reallaboren" weiterentwickelt werden muss. Gelingt dies, können Reallabore zu zentralen Bausteinen einer transdisziplinären Nachhaltigkeitswissenschaft werden.
Städte als Realexperimente haben dabei durchaus eine Tradition insbesondere in der Sozialwissenschaft, die bis auf die soziologische Chicagoer Schule der Vorkriegszeit zurückreicht (vgl. hierzu insb. Groß u.a. 2005: 65 ff.). Der Soziologe Robert E. Park (1925, 1929) hat in Chicago hierzu in den 1920er Jahren schon grundlegende Bezugsrahmen insbesondere zur Untersuchung von sozialen Veränderungsprozessen in Städten geschaffen.
Die Analyse von Systeminnovationen als „Realexperimente" kann daher auf einen Fundus an konzeptionellen und methodologischen Vorarbeiten zurückgreifen. Dies kommt zusammen mit einer wachsenden Bedeutung des Orientierungsraumes Stadt für sozial-ökologische Veränderungsprozesse.
So nimmt die Bedeutung von stadtbezogenen sozial-ökologischen Experimenten in den letzten Jahren rasant zu: Die Transition-Town-Bewegung (vgl. Hopkins 2011), die starke Zunahme Erneuerbarer-Energie-Regionen bzw. -Städte (vgl. Ökologisches Wirtschaften 2011) sowie insbesondere auf CO2-Freiheit oder -Halbierung zielende Stadtprojekte wie z.B. das der „Innovation City Bottrop" (vgl. Fischedick/Lechtenböhmer 2012) sind Belege dafür.
Dabei gibt es zahlreiche Gründe, die für Städte als Experimentierorte zur Untersuchung von Systeminnovationen im Rahmen von Global Change-Prozessen sprechen: (1) Städte sind für fast alle Lebensbereiche die Orte in denen die Erfüllung gesellschaftlicher Funktionen über gewachsene sozio-technische Systeme passiert: dies reicht von der Energie- und Wärmeversorgung über die Ernährung, die Bereitstellung von Mobilität bis zu Bildungs- und Kulturfunktionen. Daher lassen sich hier auch besonders gut die Interaktionen zwischen diesen Systemen beobachten. (2) Städte sind Kultur- und Sozialraum. Sie sind oft Entstehungs- und Kulminationsort für kulturelle Veränderungen, für veränderte Lebensstile und damit per se sozialer Experimentierraum. In ihnen lassen sich gesamtgesellschaftliche Entwicklungen faktisch im Reagenzglas beobachten und Erkenntnisse auf höhere Ebenen skalieren.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

In den letzten Jahren sind eine Reihe von „Reallaboren" für urbane Transformationen national und international entstanden. Die Methodenentwicklung und methodische Begleitung sowie die Vernetzung dieser Realexperimente weist jedoch noch Defizite auf. Im Rahmen der Weiterentwicklung der künftigen Stadtforschung - wie sie aktuell im interdisziplinären Agendasetting-Prozess der „Nationalen Plattform Zukunftsstadt (NPZ)" unter Federführung des BMBF und weitere Bundesministerien erfolgt - ergeben sich interessante Möglichkeiten zur Kopplung mit der Global Change-Forschung und dem Future Earth-Prozess, da hier idealtypisch Prozesse des Co-Designs- und der Co-Production notwendig sind. Auch eine enge Kopplung mit Gremien der wissenschaftlichen Politikberatung - wie dem WBGU, der sein Hauptgutachten 2015 dem Thema Urbanisierung widmen wird - bieten sich an.

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Es besteht ein hohes Potenzial zur internationalen Vernetzung, da heute weltweit Realexperimente einer nachhaltigen Stadtentwicklung zu beobachten sind - sowohl im europäischen als auch im asiatischen (insb. China, Süd-Korea), nord- und südamerikanischen und afrikanischen Kontext. Die gemeinsame Methodenentwicklung und Vernetzung bietet sich an (vgl. z.B. „Tandemsprojekte" wie Düsseldorf-Wuxi „Low Carbon Future Cities".)

What are the implications of global environmental change for conservation of species and landscapes including the possibilities for restoration, reversal of degradation and relocation?

Birgit Gemeinholzer

Short presentation of the theme idea in the Future Earth context:

Conservation of species and landscapes cannot always be achieved on native sites and habitats due to human land use, settlements, changes in water balance, and nutrition availability. Therefore, restoration, relocation and reversal of degradation are important topics for nature conservation. However, up to now the result of relocations, ex-situ conservation efforts, and restoration activities, and their influences upon ecosystems and population genetic processes are mostly unknown. Urgent questions which need to be tackled are:

- Do restoration and relocation efforts maintain local diversity, also in the long run?
- What are the influences of relocation, combined with shifts in ecological niches, changes in competition and ecosystem functioning?
- Do foreign genotypes lead to inbreeding or outbreeding depression, change local adaptation, or impose changes in predators, the food-web and pollination?
- Do foreign genotypes invade native habitats?

By current analyses of nature restoration projects, investigations show that the introduction of foreign genotypes of native species leads to a decrease in genetic diversity on local scales after certain years of establishment. On a regional scale, the foreign genotypes increase the genetic diversity by invading and hybridizing with local genotypes in nature conservation areas, however, might also alter the potential of adaptation, with an up to now unknown impact upon the native species' genetic diversity. As nature conservation efforts have mainly ignored the preservation of local genotypes yet, investigations here are to be deemed urgent. Safeguarding endangered species via ex-situ conservation is another possibility for the preservation of species' biodiversity. However, for plants long term strategies are missing on how to deal with small ex-situ sub-populations, how to maintain genetic diversity and is there a need to establish breeding strategies like for endangered animals in zoos. Further investigations are necessary to evaluate the long term efficiency of nature conservation activities, especially by focusing on the genetic diversity of species, communities and ecosystems, which – over time - might be altered by biotic and abiotic influences with results becoming only visible after certain years of establishment.

Short description about the expected interest of the German communities and the integrative potential of natural and social science:

N/A

Short description about of the internationalization potential of the suggested theme idea:

N/A

Transkulturelle Postmaterielle Didaktik der Transformation für Paradigmen Wechseln Training in einer nachhaltigen Futurologie der Zukunft – Postmaterialism Didactics for Multicultural Knowledge Holders and Stakeholders

Dirkmarkus Lichtenberger

Kurze Darstellung des Themas im Future Earth Kontext:

„Bürgerinitiativen mit Erkenntnistheorie!"
In metaphysisch begründeter Abwandlung dieses mystischen Slogans aus der Wissenschaftstheorie frage ich in Bezug auf das co-design with stakeholders und knowledge holders: Welche bislang zu wenig erprobten und bedachten Mittel, Gestaltungsformen und Inhalte aus Sustainable Citizen Science und Local Knowledge können wir entwickeln und anwenden, um ambitionierte Ziele einer nachhaltigen Zukunftsforschung zu erreichen? Nach einem der IPBES Antalya Consensus Eklats, nämlich der Nicht-Verabschiedung und Verschiebung der Stakeholder Engagement Strategy, die auch NGOs, indigenen und spirituellen Gruppen sofort zumindest etwas bessere Partizipation erlaubt hätte, meine bewußt etwas radikalen und provokativen Vorschläge, Thesen, Arbeitsaufträge und PR-Horizonte für Future Earth:

1 Future Earth als delokalisiertes Metainstitut für faires Teamwork zwischen Sustainable Citizen Science und klassischen Akademikern!
2 Postmaterielle Futurologie mit Futures Studies für furchtlose realistische Risikoforschung, Gute Aussichten und Nachhaltige Berufe: Risikoforschung und ethisch-ästhetische Technikfolgenabschätzung müssen vervielfacht werden. Positive Technikentwicklung und Bildungschancen für nachhaltige Berufe ausbauen. Dafür zeitgemäße Didaktik (Phänomenologie, Sinneswerkstatt, Zukunftswerkstatt, Methoden-Paradigmen-Reflexion, Meditation) an Schulen und Hochschulen entwickeln und vor allem vor Ort ortsangepasst anwenden!
3 Konzepte und Methoden der nachhaltigen Zukunftsforschung im emanzipatorischen Kontext Partizipation, Glaubwürdigkeit, Transparenz, Relevanz – ein transdisziplinärer Vergleich mit künstlerischen und ästhetischen Ambitionen.
Kritische aber sachgemäße Aufarbeitung bereits geleisteter Zukunftsforschung aller Couleur ohne dogmatische Zensur und Berücksichtigung aller Methoden ohne Ausnahme. Offene und kontroverse Fragen deutlich und ohne politische Scheu formulieren! Die stark werdende Bewegung indigener Politik mit ihren Implikationen von Horizonten einer Metaphysik und spirituellen Perspektiven alter und neuer Religionssysteme fordert nun konservative Wissensbesitzer in aller Welt zur fairen Zusammenarbeit heraus, unsere eigenen teils neuzeitlichen, teils christenkirchlich geprägten alt und tief eingesessenen Denkstile, Denkmuster und Paradigmen-Dogmen zu renovieren und in eigener mehr esoterischer Tradition gewachsene Keime der Zukunft zu pflegen. Pädagogisch-didaktische Aufarbeitung der Methoden, Konzepte und Resultate bisheriger Beschäftigung mit Zukunft und Evolution (auch SF, Utopie, Mythologie, Oral History, Metaphysik), hier sind vor allem Geisteswissenschaften gefordert, Wissenschaftsgeschichte, Kulturwissenschaft, transkulturelle und postmaterielle Philosophie usw., um naturwissenschaftliche Blicke zu lenken.
4 InhaberInnen autonomer Bildungskarrieren und DIY-Communities als nachhaltige Pioniere von Future Earth in der Nachfolge des Global Forum der UNCED 92 Rio.
5 Entwicklung einer Qualitätskontrolle für nachhaltige Projekte unter Berücksichtigung hoher ethischer und ästhetischer Kriterien, die mit sozialen Forderungen des Zeitgeistes und noch immer unerfüllten Menschenrechten unabdingbar verknüpft sind: Gemeinnützige Landreform, Grundeinkommen, Direkte Demokratie. Die verschiedenen Konzepte und Varianten dieser für eine Zukunft durch Nachhaltigkeit essentiellen sozialökologischen Menschenrechte, die gern in akademischen Scheingefechten auf Nimmerwiedersehen verabschiedet oder entstellt werden, sollten im Einzelnen im Vergleich professionell und öffentlich diskutiert werden. Informelle Transition Didaktik (non-formal education) kann Forschung und Wissenschaft zu innovativer Transformation motivieren, bewegen und anleiten.
6 Postmaterial Futures Metacouncil Sustainability! Als wissenschaftliches Gremium mit Metacharakter einer undogmatischen Beratung und Orientierung

für Entscheidungsträger (decision-makers) mit Glaubwürdigkeit, Transparenz, Partizipation und Relevanz sowie mit Open Mind und Open Heart sollte Future Earth in sehr hohem Maße unabhängig von politischen Wirren und egoistischen Richtungskämpfen forschen, beraten und handeln können. Future Earth sollte andere Gremien als Metaebene reflektieren und impulsieren.

7 Forschungspark Exploratorium Kunst, Spiel, Ästhetik für Nachhaltigkeit in der Zukunftsforschung:
Delokalisierte Netzwerk-Communities brauchen als Retreat, Forschungsknoten und Symposium-Zentrum eine neu gestaltete oder bereits unter Naturschutz stehende inspirative Forschungslandschaft (kein steriles Kongresszentrum), um auf gute Gedanken zu kommen.

Kurze Beschreibung des voraussichtlichen Interesses der deutschen Communities und des integrativen Potentials von Natur- und Gesellschaftswissenschaften:

Deutschland bietet aufgrund seiner postmateriellen Traditionen reichhaltige Potentiale auch für den Arbeitsmarkt, die noch größtenteils ungenutzt außerhalb akademischer Interessen brach liegen.
Vorauszusetzen und zu wünschen ist, das große Feld der Stakeholder und Knowledge Holder aus Sustainable Citizen Science und Local Knowledge wird von der deutschen Community der Akademiker so mit einbezogen wie im programmatischen Konzept von Future Earth beabsichtigt. Wir haben in Deutschland eine Vielzahl von seriösen Organisationen mit Kompetenz und Erfahrung auf den bei Future Earth gewünschten Gebieten non-formal education, Soziale Invention, Local Knowledge und alternative Forschungsgruppen, deren hochrangige Capacity unbedingt in den Kontext staatlicher Förderung und Sponsoring durch deutsche Wirtschaft und Stiftungen kommen sollte.
Ich favorisiere nicht nur aufgrund persönlicher Erfahrungen Richtungen und Bewegungen, deren Ziele z.T. mit den Namen E. F. Schumacher, Robert Jungk, Ivan Illich, Joseph Beuys, Hans Jonas, Paul Feyerabend, Rudolf Steiner, Augusto Boal, Marilyn Ferguson, Adolf Portmann, C. G. Jung, Buckminster Fuller, R. Murray Schafer, Vandana Shiva und anderen ProtagonistInnen einer Sanften Verschwörung charakterisiert sind und die in staatlicher und wirtschaftlicher Förderung zuungunsten der Menschheit und Erde leider sehr wenig Berücksichtigung finden.
Individuelle Organisationen dieser progressiven Zukunftsgesinnung lassen sich bei Interesse seitens Future Earth von mir ermitteln und namentlich empfehlen. In der Zeitschrift Scheidewege der letzten 40 Jahre Skepsis und Utopie findet man anregende Essays zum Teil prominenter Autoren.

Meine eigenen Initiativen der FREESTYLEUNIVERSITY FOR SUSTAINABLE ART SCIENCE TECHNOLOGY gehen bereits in diese Richtung und können im globalen Verbund Future Earth hilfreiche Aspekte einbringen, z.B.:

Forschungsdesign SARA SUSTAINABLE ACTION RESEARCH ART Initiativen
Sustainable Seedbank Didactics For Sustainable Professions

Kurze Beschreibung des Potentials der Internationalisierung des Themenvorschlages:

Das internationale Potential von Sustainable Citizen Science und spiritueller Gruppen mit indigenem und postmateriellem Wissen und Local Knowledge wächst permanent auch jenseits des Mainstreams. Hinsichtlich Bürgerinitiativen und Alternativbewegung braucht sich Deutschland im internationalen Vergleich nicht zu schämen. Interessant ist sicherlich die Aufarbeitung auch der deutschen Kulturgeschichte in Verbindung mit Auswirkungen deutscher Nachhaltigkeitskultur und Zukunftsforschung in anderen Ländern. Trotz eigener Hochleistungen sollten wir als transnational kommunizierende Wissenschaftlerinnen und Wissenschaftler bereit sein, innovative nachhaltige Paradigmen und Projekte aus und in anderen Staaten und Nationen respektvoll zu rezipieren, authentisch zu unterstützen und originell weiter zu entwickeln.
Eine Kontakte vorbereitende Evaluations-Studie kann unter einer Vielzahl gemäß der genannten sozialökologischen Kriterien geeignete PartnerInnen für eine transnationale Knowledge Stakeholder Koproduktion Sustainable Citizen Science and Local Knowledge auswählen.

VERANSTALTER:

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DFG

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