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Sustainability foresight : methods for reflexive governance in the transformation of utility systems

the Development Observatory (OdD) of the Universidad de Costa Rica (UCR), the National Environmental Forum (NEF) of the National Center of Advanced Technology (CENAT) and the National Academy of Science of Costa Rica (NAS-CR). Furthermore two regional organizations were represented in the Organizing Committee of the Forum: the Inter-American Institute for Cooperation in Agriculture (IICA) and the Comité Regional de Recurso Hidráulicos (CRRH) / Sistema de Integración Centroamericana (SICA).

The forum's objective was to communicate scientific insights on the interactions between processes of globalization and global environmental change, and the implications of these interactions for food systems and food security in Central America to policy makers of the regions. Furthermore, the forum stimulated a dialogue between scientists and policy makers on the following key questions: How should scientific results be communicated to policy? How can scientific information best be used for the planning process and the formulation of sound politics?

Besides the group of the science workshop about 60 representatives from local governmental agencies, national and international organizations, embassies, rural and other associations, private companies, industries, universities, and research attended the forum. An official Forum Publication is planned to be available in English and Spanish in October 2005. This publication will include all keynote talks and a summary of the forum's discussion, synthesis and recommendations.

In many aspects the concept of the Institute proofed to be very successful: seeds were laid for the establishment of a strong network of young scientists and policy makers analysing the processes of food systems, globalization and global environmental change. Some of the participants are now eager to participate in the scientific networks of the IHDP core projects. Communication within this group is facilitated through a list server that has been set up prior to the institute. The multi-disciplinary proposal groups formed during the institute elaborated some strong proposals and the majority is keen to apply for funding to realize their ideas. Finally, two reports will be put together, describing the workshop and the Science Policy Forum as well as their outputs, respectively. These reports will be available in October 2005. A homepage for the workshop has been established, and meanwhile provides information on the event: **www.iaisummerinstitutes.iai.int**.

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MAARIT THIEM, International Science Project Coordinator, and VALERIE SCHULZ, Research Assistant, organized the IHDW 2004 on behalf of the IHDP Secretariat; **thiem.ihdp@uni-bonn.de; schulz.ihdp@uni-bonn.de; www.ihdp.org**

SUSTAINABILITY FORESIGHT

Methods for Reflexive Governance in the Transformation of Utility Systems

BY JAN-PETER VOß

➤ **Utility systems for the provision of electricity, gas, water or telecommunication are at the interface of society and nature. They *interconnect* broader production and consumption patterns and are thus of central importance for sustainable development. Yet, they are particularly difficult to shape. Large technical systems are intertwined with patterns of market organization, administrative institutions, user routines and policy networks. Transformation is not a matter of planning and control but of co-evolution across such heterogeneous domains. The transformation of utility systems therefore, exemplifies the limits of conventional steering approaches to achieve sustainable development. Reflexive governance forms are needed which take into account the embedding of steering activities in dynamic system contexts, and which take up uncertainty, ambivalence and distributed influence as basic features for shaping sustainable development. Sustainability Foresight represents a methodical approach to make reflexive governance operational. It is currently being probed in German utility systems.**

Current transformations in utility systems in almost all industrialized and many developing countries have two major dimensions. One is structural change triggered by liberalization and privatization policies which have become widespread in the 1990s. These have set off structural adaptations across the domains of technology, market organization, political institutions and cultural meaning (i.e.development of small scale generation technologies surges as market risks demand flexibility, companies engage in cooperation and mergers, industrial associations fall victim to increasing competition among members, regulatory institutions are gradually strengthened to guarantee non-discriminatory access to networks, freedom of the customer choice gains importance where public service was long a dominant value orientation) (Patterson 1999; Schneider 2001). The other dimension is represented by a widely recognized need to shift utility systems towards sustainability, and by respective measures for efficient resource use, climate protection, regulation of technological risks, empowerment of consumers etc. (Kemp 1996; van Vliet 2002; Elzen et al. 2004). Changes in both dimensions work together in softening up utility regimes that have been stable for decades (Hofman, Marquart 2001). The current situation of flux thus opens a window of opportunity for the establishment of sustainable patterns of utility provision. At the same time, however, new path-dependencies could emerge and inhibit sustainable change for the decades to come. These can, for example, arise from long-lasting (re-)investments in plants

and facilities, from a dismantling of transmission networks in course of radical decentralization (which would then impede solar electricity import) or from vested interests which build-up around new utility structures as they become established. A topical question, therefore, is how emerging socio-technical configurations such as decentralized generation of electricity and drinking water, information technology based facility management services or new regulations of network infrastructure interact within broader transformation processes, how they can be assessed with respect to sustainability, and by which strategies they can be shaped.

CO-EVOLUTION AND REFLEXIVE GOVERNANCE

Development of utility systems and related sustainability impacts are determined by the interaction of many heterogeneous factors such as market strategies of companies, consumer attitudes, public debate, political institutions, technical accidents, environmental indicators etc. (Hughes 1987; Norgaard 1994; Schneider, Werle 1998). These factors follow their own contingent dynamics; at the same time they interact and influence each other. Transformation can therefore be understood as a co-evolutionary process: its overall dynamics result from intertwined feedback circles rather than linear cause-effect relations (Geels 2002; Konrad et al. 2004). Any steering actor, be it government officials or corporate managers, is herself embedded in and part of these dynamics (Rip 1998). Against this background the efficacy of simple steering approaches which assume predictability of system dynamics, non-ambivalent goals and concentrated steering powers is severely reduced. They entail unintended effects which can grow out to new and more severe "second order problems" (cf. acid rain following high chimney policies against local air pollution, or repercussions of the "green revolution" in agriculture) (Beck 1994; Becker et al. 2001). This is because they do not practically acknowledge the specific features of steering for sustainable transformation (Voß, Kemp 2005):

- **Transformation processes** are complex, self-organizing and comprise human action. They are not fully comprehensible and predictable. Uncertainty and ignorance about future system development and effects of interventions are unavoidable.
- **Sustainability goals** (based on criteria for long-term viability of socio-ecological systems) cannot be unequivocally determined. Operationalizing sustainability requires a delicate balance of multiple goals which are weighed differently by actors.
- **Capacities to influence** transformation are distributed among many autonomous, yet interdependent actors. There is no central control, but transformation is an emergent result of interaction.

If these features are unavoidable, how can transformation processes be shaped for sustainable development? As a first step, requirements for reflexive governance can be derived from scrutinizing particular problem features, which appear for system analysis, goal formulation and strategy implementation (see Table 1). They generally imply an opening up of cognitive and institutional frameworks in order to work productively with indeterminacy and possibility of unintended effects. Recent governance innovations in various practice domains indeed reflect these requirements (Voß et al. 2005a).

Aspect of Problem treatment	System analysis			Goal formulation	Strategy implementation
Specific problem features	Co-evolution of heterogenous elements across multiple scales (society, technology, ecology)	Uncertainty and ignorance about transformation dynamics and effects of intervention	Path-dependency of structural change, high societal impact	Sustainability goals involve value trade-offs, are endogenous to transformation	Capacities to influence transformation are distributed among actors
Strategy requirement	**Trans-disciplinary knowledge production**	**Experiments and adaptivity of strategies and institutions**	**Anticipation of long-term systemic effects of measures**	**Iterative participatory goal formulation**	**Interactive strategy development**

Table 1: Strategy requirements for reflexive governance

SUSTAINABILITY FORESIGHT: ORGANIZING SOCIETAL SEARCH PROCESSES FOR SUSTAINABLE DEVELOPMENT

Sustainability Foresight represents an operationalization of these requirements into a concrete procedure for shaping sectoral transformation processes. It is currently being probed in the German utility system (for more information see www.mikrosysteme.org). The general approach is to organize future-oriented learning among actors who *do transformation* in the field of production, consumption or political regulation. Starting point are their expectations about the future which work as a "narrative infrastructure" that enables and restricts agency in the presence – for example by promising return on investment in particular technologies or threatening social protest against certain policies (van Lente, Rip 1998; Deuten, Rip 2000). Sustainability Foresight explicates, scrutinizes, assesses and evaluates partly implicit expectations about transformation dynamics and draws new implications for strategic action (Grin, Grunwald 2000). This is achieved by confronting particular actors' perspectives on transformation with each other, thereby de-constructing them into the underlying assumptions, and re-constructing them into a shared *reflexive* perspective which comprises the diversity of factors, possible meanings and values that underlie transformation (Grunwald 2000). Such a perspective cannot be unequivocal but must comprise uncertainty and ambivalence. A "reflexive vision" of sustainable paths of transformation thus includes *several alternative future scenarios* with specific sustainability assessments. These assessments may include areas on which actors have diverging opinions. Such an outlook does not justify powerful measures to enforce particular innovations but requires careful experimentation with a portfolio of strategy options (Küppers 1994; Weber 2005). Sustainability Foresight thus provides a procedure to frame societal search processes for sustainability. The particular steps are clustered in three phases (for an overview see Table 2).

Phase	Process steps	Actors
Adaptation to problem area	Scanning of future discourse and visions discussed in problem area	Project team
	Development of heuristic conceptual framework of the transformation process	Project team
Phase I: Explorative scenarios	Collection of factors which influence transformation	Stakeholders
	Selection by uncertainty and impact, elaboration of alternative projections for 30 factors	Stakeholders
	Cross-impact analysis, construction of scenarios as combinations of factor projections, composition of narrative storylines for selected scenarios	Stakeholders
Phase II: Discursive Sustainability Assessment	Elicitation of criteria for sustainability assessment held by stakeholders	Stakeholders
	Development of impact profile of scenarios with respect to identified criteria	Experts
	Discursive assessment of risks and opportunities connected to scenarios	Stakeholders and experts
Phase III: Shaping innovation processes	Identification of critical innovation processes (contingent across scenarios and high sustainability impact)	Project team
	In-depth analyses of actor networks and context conditions of critical innovations, identification of ‚loci of influence'	Project team and stakeholders
	Development of integrated strategy for shaping interdependent institutional, cultural and technological innovation	Project team and stakeholders

Table 2: Overview on the Sustainability Foresight Process

Phase I: Explorative scenarios

The first phase comprises the identification of key factors of influence in the transformation process, the exploration of contingencies in their development and mutual interplay and the construction of four alternative scenarios of the future utility systems. The process is carried out as a series of scenario workshops with 20 participants who represent a diversity of perspectives from production, consumption and regulation in the problem domain (Ringland 1998: 195). Differences in actors' conception of reality are made transparent, a range of possible future development paths is explored and technological, institutional and cultural innovation processes which may become decisive for alternative structures in the future are identified (for example "development of smart building applications", "self-generation of utility services" or "network regulation").

Phase II: Discursive sustainability assessment

The second phase comprises the elicitation of evaluation criteria which are applied by different stakeholder groups to assess the sustainability of utility systems, the determination of impacts of the alternative scenarios on these criteria by an interdisciplinary team of experts, and the discursive assessment of transformation paths with respect to opportunities and threats for sustainable development by stakeholders (Renn et al. 1993). The result of the assessment phase is a map of the "societal evaluation landscape" which includes threats and opportunities on which actors' evaluations converge as well as developments on which evaluations diverge. In combination with Phase I these hint at critical innovation processes, which form starting points for differentiated shaping strategies.

Phase III: Strategic experiments

The third and last phase focuses on actions to shape critical innovation processes. Critical innovations of technological as well as institutional type are first analysed with respect to actor networks and context factors, which shape their further development. For each innovation process, micro-scenarios are constructed which are embedded in the macro-scenarios from Phase I. This serves to identify branching points, bottlenecks, thresholds or other process stages at which they are particularly mouldable (Rip, Schot 2001). These prospective innovation studies form the basis to develop strategic experiments with stakeholders. Depending on the evaluation of innovations as an opportunity, threat or potential area of conflict, experiments follow different orientations: either promotion of innovation, regulation and development of alternatives, or monitoring and conflict resolution.

A key characteristic of Sustainability Foresight is to link experiments for shaping particular innovation processes with a reflexive vision of future transformations. Societal learning takes place, as experimentation with specific innovations demonstrates new possibilities and impacts and leads into a revision of broader transformation scenarios and their assessment – which in turn alter the perception of critical innovation processes and call for a reorientation of strategic experiments (cf. Grin et al. 2000; Kemp, Rotmans 2001; Truffer et al. 2003).

INTERMEDIATE RESULTS AND OUTLOOK

The probing of Sustainability Foresight in the German utility sector has gone half its way. The process started off with a review of discourses on the future of utility systems. This showed three dimensions along which actors' expectations converge: (1) System structures are going to be more decentralized than today, (2) utility provision will show a stronger service orientation, with dissolving boundaries between supply and demand, and (3) organizational and technical linkages between electricity, gas, water and telecommunications will become more intensive. These dimensions opened up an exploration space in which alternative developments were investigated through scenario workshops in Phase I. Four resulting scenarios portrayed a more ambivalent picture than suggested by general discourse. Decentralization, for example, was differentiated into a technological and an organizational dimension. Across the four scenarios, plausible developments could be identified, which comprised various combinations, for example, technological decentralization combined with highly centralized forms of market organization. Stakeholders who participated in the process valued the opportunity to stand aside and collectively reflect on broader contexts of their daily work without being constrained by professional role requirements. So far, the method has proven robust for implementation. A final evaluation can only be given after completion of the process. Already now, however, Sustainability Foresight offers new perspectives to think about and experiment with reflexive governance arrangements by which intricate paradoxa of steering in context with co-evolutionary dynamics can be turned to a fruitful tool for the societal search for sustainable development. This is where some of the most fundamental challenges for the human dimensions of global environmental change can be found.

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References to this article are included on the IHDP website at www.ihdp.org/updatefood05/references.htm

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