

- *Climate change – Adaptation – Nature-society interaction – Ecosystem services*

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**Shaping Relationships with Nature –
Adaptation to Climate Change as a Challenge for Society**

*Gestaltung der Naturverhältnisse –
Anpassung an den Klimawandel als gesellschaftliche Herausforderung*

Climate change has become a highly politicised issue over the last couple of years. In particular adaptation to climate change raises fundamental conceptual challenges concerning the interplay of societal and biophysical processes. The paper discusses some of these challenges and introduces a theoretical concept able to improve our understanding of the complex interactions between nature and society. The concept of ‘societal relationships with nature’, which originated in the so-called ‘Frankfurt School’ of critical theory, provides a dialectic approach towards these complex interactions able to deal with the societal causes of climate change as much as with the repercussions of global warming on societies, including the claim for balancing mitigation and adaptation needs. Basically, the goal of sustainable development has returned on the agenda in a new form: To what extent are societies in the ‘North’ and ‘South’ respectively able to deal with the vulnerabilities created or heightened by climate change? In this context, the spatial dimension of climate policy at and between the different spatial scales is becoming an ever more pressing problem, which is illustrated using the transformation of ecosystem services as a case study.

1. Introduction

The issue of climate change took over the political agenda with remarkable speed in 2007. Since publication of the last assessment report of the Intergovernmental Panel on Climate Change (IPCC 2007) climate change has come to be regarded worldwide as a reality. Governments around the world have also been more willing to

take up this challenge – prominently among them the US government – since the ‘Stern Report’ set out the costs of climate change (Stern 2007). Alongside the issue of avoiding or reducing greenhouse gas emissions (mitigation), the issue of adaptation to this new reality is also being accorded greater attention (KOM 2007, UBA 2008, BMU 2008). Nonetheless, the Copenhagen Conference on Climate Change in

December 2009 and its failure remind us that current concern with climate change is no guarantee of positive action: More than ever it is not at all clear yet which response strategies will become established over the long term or what specific measures they will entail – not to mention whether or not they can be regarded as adequate given the problems facing us. The financial and economic crisis has also played a prominent part in prompting fears that the issue of climate change might be overshadowed by the implementation of short-term measures to boost the economy and could even be massively undermined by them.

A social-scientific treatment of this set of themes thus faces three closely related challenges:

- The first task is to identify and understand the significance of the issue, as conveyed by the mass media, against the background of the political power play involving political parties and social interest groups. Discourse analytic and discourse theoretical approaches are particularly well-suited to this task, given their ability to examine the ways in which dominant, or hegemonic, patterns of interpretation become established. Thus some of the questions that might be asked include: Is climate change considered a reality? Which priorities are being set in the context of the global economic crisis?
- Secondly, it is necessary to establish an analytic framework capable of taking account of the ways in which the problem is embedded into the overall reproduction of society and its associated dynamics – an encompassing framework of a theory of society. From this perspective, questions have to be addressed as for example: What impacts – direct and indirect – does the global financial crisis have on climate policy? Historically informed analyses of societal development may prove helpful here, such as those offered by the regulation approach.
- Thirdly, we also need to ask what the discursive treatment of the problem and the overall societal dynamics means confronted with its material-energetic dimensions: What would appropriate response strategies look like in view of these ‘natural’ dimensions? Is, for example, the “2°C goal” of limiting global warming over the 21st century to 2°C itself a meaningful goal? Or is it too low in face of certain ecosystems that will collapse in advance like the corral reefs (TEEB 2009)? And can current measures still succeed in achieving this goal? Moreover: In what ways are these material dimensions accounted for in discursive interpretations of the problem: Can we, for example, identify ‘planetary boundaries’ of the earth system (Rockström et al. 2009)? And if it is possible to define such boundaries: Is it possible – and how? – to steer world societies within such boundaries? How can we in practical terms respect certain limits concerning the appropriation of nature?

All these challenges relate to broad areas of research and can therefore largely be addressed only in the context of wide-ranging interdisciplinary work (see concerning land use and climate adaptation strategies: Seppelt et al. 2009). Furthermore, the various analytic steps can be accomplished by means of many different research approaches and methods, which require closer examination which cannot be achieved in the present article. Instead the following remarks concentrate on identifying a few specific challenges entailed by the issue of climate change adaptation. Moreover, this paper presents a theoretical approach – termed ‘societal relationships with nature’ – as a specific approach towards a political ecology, capable of meeting the challenges mentioned above¹. This narrowing of focus is connected to the thesis that the issue of climate change adaptation throws up far-reaching challenges with regard to shaping societal development –

including, in particular, societal relationships with nature – on a global scale. Basically, the goal of sustainable development has returned to the agenda in a new form: To what extent are societies in the ‘North’ and ‘South’ respectively able to deal with the vulnerabilities created or heightened by climate change? Are they able to meet these challenges in the long run and thus create sustainable societies? In this context, the spatial dimension of climate policy at and between the different spatial scales is becoming an ever more pressing problem. Thus the third section of the paper wants to illustrate what climate change adaptation might mean specifically in terms of shaping societal relationships with nature using the transformation of ecosystem services as an example.

2. Climate Change Adaptation as a Political and Scientific Challenge

The issue of adaptation to climate change was taboo for a long time (*Pielke et al. 2007*); in fact, despite the increased attention that has been given to the issue, the taboo has not yet really been overcome. It has to do with a certain narrow understanding of adaptation which says that adaptation is needed because of the failure of climate change mitigation: In this view, the reason we have to engage with adaptation is because measures aimed at limiting or reducing climate change have failed. This understanding is underpinned above all by the Framework Convention on Climate Change (FCCC) and the understanding of climate change set out in it. The definition contained in the FCCC focuses solely on the anthropogenic causes of climate change: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (FCCC 1992: Article 1, 2).

This narrowing of the international convention to ‘human activities’ as a cause of climate change certainly makes sense from a political point of view. After all, it is only in relation to human activities that can be influenced by humans that political responsibility can – and must – be assumed². However, this narrowing of focus gives rise to two implications that are not unproblematic for the political and scientific debate. First, the FCCC definition fuels arguments over whether climate change is caused solely by greenhouse gases or whether other ‘natural’ factors can also be held responsible for it – a dispute which has influenced and stymied climate policy for a long time: Is there proof of anthropogenic causes, is there a ‘fingerprint’ (*Beck 2009*)? Only once such proof has been furnished can concrete measures – and in particular specific burdens or restrictions – really be justified. The second implication arising from the FCCC definition is one which touches more closely on the question of adaptation, since this narrow definition suggests that the need for adaptation only arises when climate protection has failed. Since natural changes in the climate are ignored by definition, climate change according to the FCCC definition is the result of misguided or inadequate climate policy – and this, of course, is something no one wishes to admit. Thus it is this nexus – and, with it, the abstract opposing of mitigation and adaptation – that has been responsible for making measures aimed at adaptation to climate change a matter of taboo for a long time.

As *Roger Pielke* has shown (*Pielke 2005; Pielke et al. 2007*), though, this limited perspective on climate adaptation is neither helpful nor cogent. If we are guided not by the narrow definition of the FCCC but by the broad definition of the Intergovernmental Panel on Climate Change (IPCC) we are led to a broader understanding of climate change. According to the IPCC climate change is ‘change arising from any source’ (IPCC 1996: 13). This includes anthropogenic and

‘natural’ causes (natural variabilities in the global climate, including those stemming from increased solar activity) in equal measure³. Thus natural variabilities are fully accepted within this broad definition without there being any need to deny society’s responsibility for those elements of climate change for which humans are responsible. Climate change mitigation measures certainly do influence the extent of climate change and are thus not in opposition to adaptation.

Thus if we accept the broad definition of the IPCC, adaptation to climate change would definitely have to occur. It is irrelevant here whether observable climatic changes stem exclusively from anthropogenic causes or whether some measure of natural climate variability plays its part. Of course, this does not make the issue of anthropogenic causation or its role in climate change – and thus the question of international responsibility – redundant: There is strong evidence that anthropogenic causes at least intensify natural variabilities. According to this broad definition, however, mitigation and adaptation can no longer be placed in abstract opposition to one another. Instead, we are confronted with the challenge of adapting to climatic variability caused by both natural and societal factors. The significance of this broader understanding and of the interactions between natural and societal factors becomes particularly evident when studying the impacts of climate change and potential responses to it. This is because both societal and natural factors feed into one another, especially in the case of climate-related vulnerabilities. The ways climate change impacts on certain regions and what demands and possibilities exist with regard to adaptation depends on a number of factors.

- a) First, it depends on the extent of global climate change. This means that, in addition to ‘natural’ causes of climate change, it also depends on
- b) the effectiveness of climate change mitigation measures in lessening or, in the case of

increasing greenhouse gas emissions, intensifying climate change.

- c) In addition to this, regional specificities of climate change play a crucial role: Which regions are particularly affected and in what ways? All these factors together determine the exposition of a certain region to climate change (IPCC 2007a).
- d) Moreover, concerning the vulnerability of these regions, it is also important to analyse which socioeconomic processes are at risk from specific regional impacts (its sensitivity; IPCC 2007a). This may take very varied forms, from large-scale economic damages (such as those caused by storms or floods in densely populated regions like megacities; *Heinrichs and Kabisch 2006*) through to the precariousness of the natural resource base of marginalised groups (e.g. in semi-arid regions characterised largely by subsistence agriculture). Consideration needs to be given also to the fact that sensitivity is nothing given but produced by former socioeconomic activities (*Pielke 2005*). Moreover, vulnerabilities do not have one single cause but are caused by the interplay of several drivers which means that climate change often intensifies existing problems (such as the risk of drought events as well as social problems like inequitable distribution of land and/or income, etc.).
- e) Finally, the existence – or indeed the lack of – societal capacity to respond (adaptive capacity according to IPCC 2007a) is crucial: Which regions have the necessary resources, know-how and political will to meet these new challenges?

The issue of adaptation to climate change thus throws up far-reaching challenges in terms of shaping societal development and, more specifically, societal relationships with nature as a whole. Attention needs to be given here to both the harm done to the ‘natural’ environment

(including the climate) by human activity as well as to the retroactive impacts of this altered environment on the various sectors of society. In addition, questions need to be asked regarding the ways particular regions will be affected by regional climate fluctuations and what kind of social vulnerabilities and adaptive capacities exist there. To gain an adequate comprehension of the issues, then, a dialectical understanding of the relationship between nature and society is required, capable of taking into account the mutual dependencies and interactions between various biophysical and societal processes as well as the possibilities for reshaping these interactions. Moreover, the specific spatial (scalar) dimensions of the mutual interdependencies in different regions and the interplay between global and national climate policies and local or regional adaptation strategies must be analysed carefully.

This dialectical understanding thus contradicts the view that climate change adaptation demands a switch from climate protection to the protection of society. This latter view contends that if the concept of mitigation is about protecting the climate (or nature in general) from societal interventions, then adaptation must mean protecting society (again) from the negative influences of nature (*Stehr and von Storch 2005*). In contrast to this, the concept of societal relationships with nature attempts to take account of the reciprocal dependencies between nature/climate and society (economy, politics etc.) and is directed neither at protecting some abstract nature nor indeed at protecting society; instead, it seeks to reshape the interrelationships between society and nature. Viewed from this perspective, current debates around adaptation to climate change offer a certain opportunity to 'rethink climate' (*Brunnengräber et al. 2008*) and to gain an understanding of the multiple connections between society and nature at different spatial levels. Seen from this perspective, the need for a comprehensive shaping of societal relationships with nature

becomes pressing, and it becomes apparent that this need extends far beyond previous climate change mitigation measures. This is because the issue of adaptation throws up considerable challenges to do with the precise interplay of natural and societal factors⁴, in particular questions about complexity, our ability to influence conditions, responsibility, uncertainties, and so forth, including the question of different time scales.

In all these issues, though, mitigation and adaptation are not in opposition to one another but mutually influence one another: Extent and concrete strategies of mitigation measures influence adaptation needs and strategies (e.g. in the case of biofuels; cf. below) and adaptation measures can influence GHG emissions (e.g. land-use change; *Seppelt et al. 2009*). This in turn raises the challenge of policy integration: To what degree does climate policy represent an integrated, comprehensive strategy, and how well are individual policy measures integrated into it? If the degree of mitigation substantially influences adaptation requirements and if adaptation measures often have impacts on mitigation, then this shows clearly once again that we should not be looking at individual technical or political measures in an isolated, separate way. Instead, their real effectiveness depends on the societal and natural environment in which they are implemented and on the interactions that take place with this environment (cf. for climate policy integration: *Mickwitz et al. 2009*). What needs to be considered, then, if climate policy is to be a success, is 1) the way in which societal relationships with nature as a whole are regulated by society, and 2) the societal responses available for reshaping this mode of regulation. The precise relationship between regulation and reshaping at the various levels of action constitutes the key political and scientific challenge posed by climate change adaptation. This includes the interplay of global, national and regional/local measures, the extent of causation and responsibility, as well as the distribution effects and justice issues associated

with climate change. Just how these challenges can be taken up in an integrated concept will be illustrated in the following with the aid of the concept of societal relationships with nature.

3. The Concept of Societal Relationships with Nature – Some Initial Ideas for a Political Ecology

The concept of societal relationships with nature is rooted in the critical theory of the Frankfurt School and, to this extent, is located within the tradition of Marxist theory; however, it also represents a break – in fact, several quite clear breaks – with this tradition (for a more detailed account, see Görg 2003). The most important break for our purposes here relates to the traditional Marxist belief in progress and its associated assumption that social emancipation is based on an ever growing capacity to dominate nature. As *Walter Benjamin* stressed as far back as the early years of the 20th century, such a notion of progress refuses to recognise setbacks, to acknowledge that such emancipation has its limits and that nature bears the brunt of this fact (*Benjamin* 1980). *Max Horkheimer* and *Theodor W. Adorno* take up this message in their *Dialectic of Enlightenment* and generalise it to develop a new understanding of history and society:

‘Any attempt to break the compulsion of nature by breaking nature only succumbs more deeply to that compulsion. That has been the trajectory of European civilisation’ (*Horkheimer* and *Adorno* 1987: 35, own translation).

According to this message, we cannot escape our dependencies on nature via the mastery of nature. On the contrary, the mastery of nature leads to new ways of dependencies embodied in the new environmental risks of the ecological crisis. The concept of societal relationships with nature fundamentally addresses the relationship between society, the individual and nature. It sees

this as a dialectical set of relationships in which all three elements are intrinsically connected with one another: At all times, each element is what it is only in relation to the other two. This means that just as there is no such thing as a non-social individual who is not also dependent on nature (in the truest sense of the word, as a bio-physical condition of his or her life), there can be no society without relationships to nature (and without individuation); and nature, too, must always be conceived of as being within the historical process of its appropriation. This appropriation and indeed relationships between nature and society in a broader sense have both a symbolic, linguistic dimension and a material, physical dimension. While the latter refers principally to economic and technical forms of appropriation, the symbolic-linguistic dimension encompasses culturally mediated patterns of perception, including scientific descriptions of nature and related explanatory frameworks. Further, societal relationships with nature must always be expressed in the plural form, since their specific manifestations are many and varied – and in some respects contradictory. What is required is a social theory approach that takes account of the interconnections between economics, technology, science and culture and the manner of their political regulation (*Görg* 2003).

The concept of societal relationships with nature was developed from the mid-1980s onwards for the purposes of ecological debate; a number of quite different versions have been elaborated in the process (*Becker* and *Jahn* 2006). Central to the dialectical concept is a dual understanding of nature:

- as a material product of socio-economic transformation, i.e. a technically and economically mediated appropriation and constitution of nature (and not as untouched nature once all human activity has ceased; see above, Note 4),
- as a symbolic construction: nature as a cultural construct (including aesthetic and nor-

mative dimensions) and as a scientific construction (which again is technologically mediated, i.e. dependent on technical apparatus and procedures).

Thus materiality and symbolic construction are not seen as opposites, as so often happens in the ecological debate. Instead, the issue is that of the precise relationship between the two processes: How can we understand materiality if at the same time we need to take symbolic construction (e.g. in the natural sciences) into account? The guiding assumption here is that nature qua social construction is contingent but yet is not arbitrary in its materiality. In other words, the way nature is constructed in society – be it in scientific or technological terms or linguistically – is left to societal mechanisms and in this respect is historically contingent or, to be more precise, societally determined, that is, not decided by the material properties of nature. Thus while this construct still retains material properties, these may be modified by the social constructions of them, and their internal laws may even be violated at times – and it is this that creates problems for society, of which, self-evidently, we have more than enough. In this respect the analysis of societal relationships with nature is focused on limits in the construction of nature, on the limits of its material appropriation, and on the limits of its cultural construction. To put it in the words of *Adorno*: It is focused on the non-identity of nature, on the properties of nature which are at odds with human constructions of them and which we come up against in the risks and dangers involved in appropriating nature.

This dialectical conception has repercussions for the analysis of climate change and adaptation. First, we need to analyse exactly how ‘nature’ is given to us as a symbolic construction. In our example, this requires us to explore the symbolic constructions of climate change in scientific descriptions and in political and public discourse (asking questions, in particular, about dominant

or hegemonic patterns of interpretation). This relates in particular to the mechanisms through which the reality of climate change is established in society, namely through scientific analyses and assessments and their reception and dissemination in the political and public spheres. Analysing the processes through which climate change is constructed has nothing at all to do with denying the reality of it. Instead, it is about taking seriously the insight that meanings shared by society have to be created by and within society. Creating these meanings is a multi-stage process, starting from the relative consensus established in scientific circles and spreading through informed members of the wider public and politicians through to the broader public sphere created by the mass media. However the ‘reality’ of climate change is portrayed in the course of this process, whether accurately or erroneously, descriptions of the problem have first to be defined and disseminated more or less consensually. There are usually a variety of perspectives on this reality at work here, according to the different disciplines or scientific approaches and methods through which the problem is variously analysed and defined. Even more strongly formed are the different views in both policy and public debate, where they are often almost inextricably bound up with political or economic interests. The history of climate discourse offers a host of instructive examples of this meshing of scientific with political statements – and the question of which interpretations become dominant has a political significance that is not to be underestimated (*Hulme* 2009).

The concept of societal relationships with nature demands that we do not remain content with a discourse-analytical reconstruction of these debates – let alone that we assume the problem therefore does not exist. Instead, we need to see these symbolic or linguistic constructions of nature as being interconnected with the material dimensions of the problem. This can not be done by contrasting the various discursive constructions of climate change with its actual reality,

since any statement about reality is initially itself a construction. What we can do, however, is examine which societal modes of appropriation or forms of use are linked with certain material properties of nature and how these modes of appropriation are regulated in society. This is referred to by the term regulation of relationships with nature⁵. Regulation in this context does not mean initially that the appropriation of nature actually occurs successfully, with no potentially adverse side-effects. Quite the contrary: according to regulation theory, 'regulation' refers to the stabilisation of what are, in principle, contradictory societal relationships, without these contradictions being resolved (*Lipietz* 1985). Thus the concept of regulation is an attempt to take account of real, existing dependencies, or couplings, between nature and society, where the particular focus is on societal processes of appropriation and on their institutional forms of regulation at the various levels of action, with attention being paid to the links between them (cf. for the appropriation of genetic resources and the role of the internationalised state in this, *Brand et al.* 2008).

Therefore, two kinds of analysis have to be linked to one another: The analysis of discursive conflicts, of the associated forms of appropriation of nature, and of the increasing occurrence of these conflicts in regulating institutions (and ultimately in a historically relatively stable mode of regulation) has to be linked with an analysis of the consequences this has for biophysical processes themselves: How do certain modes of regulation impact on abiotic and biotic nature and what impacts do such processes of transformation in turn have on society? Including these two levels of analysis requires in turn the inclusion of scientific and technical knowledge and to this extent entails crossing the boundary between the natural and the social sciences. Only when this has occurred can the analysis be taken further in terms of exploring a better, less destructive reshaping of societal relationships with

nature. To use the words of *Walter Benjamin*, the intention here is not to master nature but to master relationships with nature. Thus, the aim of such a reshaping is not to gain ever greater control of our material environment but to monitor and evaluate our forms of appropriation and use of nature and their consequences for environment and society by taking into account dependencies and the limits of use. In addition to scientific knowledge, normative and political issues play a crucial role, too, given that reshaping relationships with nature is indisputably a political task: It involves problems of distribution and questions of justice and is deeply implicated in issues of power and domination at and between global, national and regional levels of action. This combination can be illustrated at the present time in particularly vivid form by the issue of adaptation.

4. Theoretical and Practical Implications – Ecosystem Services Under Climate Change

In addition to the dialectical understanding of nature and society, one of the most important consequences of the concept of societal relationships with nature in relation to the debate about climate change is the fact that we need to take account of the wider societal context, including scientific and public discourse, conditions of economic exploitation, and global power relations (*Brunnengraber et al.* 2008, *Newell* 2006, *Hulme* 2009). In other words, we are not dealing merely with environmental problems in isolation. Instead, we need a comprehensive understanding of the institutional regulatory context governing societal relationships with nature, taking into account the historical specificity of this mode of regulation with its various crises and processes of transformation. This is particularly necessary in the case of climate change, given that climate policy is being increasingly acknowledged as a complex cross-cutting theme that generates

considerable problems of policy integration in almost all sectors of society (Mickwitz et al. 2009, Beck et al. 2009). Thus there is a growing awareness of the fact that concerning climate adaptation we need to take notice of complex overlaps and societal feedback processes, such as those between greenhouse gas emissions and climate variabilities, the rising costs of fossil fuels and societal consumption patterns, the social and ecological impacts of mitigation measures (such as in the case of bioenergy and particularly biofuels), and the adaptive capacities of different sectors of various societies. In order to be able to assess these interconnections and retroactive impacts, a social theory approach is needed that considers the connections between economics, technology, science and culture in the production of nature and is capable of doing justice both to the scientific aspects as well as to the problems of policy regulation.

These interconnections can be demonstrated by looking at the state of global ecosystems and their importance for societal development and climate change adaptation. Over the last few years the concept of ecosystem services has been elaborated as a means of elucidating the interconnections between natural and societal processes. More recently, it was also recommended as an approach to address climate change mitigation and adaptation (World Bank 2009). It seeks to document the multiple ways in which 'human well-being' depends on the functioning of ecosystems (from provisioning services, such as providing food, and regulating services, such as flood protection and the capture of greenhouse gases in forests or moorland, through to cultural services, such as leisure and tourism; MA 2005a). As the Millennium Ecosystem Assessment has shown, climate change is set to become the most important driver among other human-made drivers of ecosystem change, such as the fragmentation of habitats, overexploitation and nutrient loading (MA 2005a: 16, Fig. 13).

This generalised message, however, conceals that such global processes have highly varying impacts in different regions of the world. The last IPCC Assessment Report (2007) pointed out that Climate Change will probably have very different impacts in different parts of the world and that semi-arid regions in parts of Africa will be especially severely affected. The MA framework itself, thus, asked for multi-scale assessments to analyse the specific interplay of ecosystems services and human well-being on different scales of analysis and in specific regions (MA 2003, 2005b). It cites several reasons for this. First, even scientific observations turn out to vary depending on whether data are recorded at a global, regional or an even smaller scale, and that up- or downscaling such data presents no small problem (Rotmans and Rothman 2003). Beyond these more scientific and technical difficulties in making assessments, though, it is also necessary to take account of the reciprocal interactions between the scales – such as between the global climate and local ecosystems. Even here, then, the individual scales can not be regarded in isolation – rather, cross-scale interactions (MA 2005b) need to be analysed.

More serious for our purposes are the challenges that arise when we wish to establish a connection between ecological scales and the various levels of societal action. If we take the Amazon rainforest as an example, deforestation in this region undermines the regulating services provided by the forest for the world's climate at global scale. At the same time, the forest provides provisioning services (food, shelter etc.) beneficial for the human inhabitants of the forest at the local level, but represents also revenue at the national scale (timber, mineral resources etc.). Thus the implications of different services of the same ecosystem may be contradictory when the different levels are considered: The global level (the world's climate), the national level (resources for national economic strategies) and the local level (the people directly af-

fected). Moreover, these cross-scale interactions increase exponentially when policy processes and the level of political action are to be considered as well (Cash et al. 2006, Görg and Rauschmayer 2009). Thus, the question emerges at which level which measures ought to be implemented? Moreover, do these levels (such as e.g. the regional level) even command the requisite competences or resources for the job?

These cross-scale interactions have considerable implications both for the direct consequences of climate change as well as for adaptation strategies. It is necessary here to consider the highly varied forms taken by societal relationships with nature and their specific modes of regulation. Rural regions, in particular those which are largely characterised by subsistence agriculture or small farming businesses, are highly dependent on the state of ecosystems. To be more precise, these regions are directly affected by the deterioration in ecosystem services, caused by climate warming instantaneous or in connection with other drivers (poverty, overexploitation etc.). By contrast, industrialised countries and regions often fail to perceive their dependency on nature for several reasons, e.g. their economic and technical capacity to respond to climate change and the opportunity costs of adaptation measures. Some of these reasons, however, are linked to the fact that the ecosystem services on which industrialised countries depend are provided within other regions of the world and they are therefore only indirectly affected by their deterioration (e.g. in the form of higher prices, at least for a while until the collapse of ecosystem services threatens industrialised regions, too – like by global warming). Thus while the conditions of dependency on functioning ecosystems experienced by rural regions are well-known, little awareness remains of the fact that industrialised countries and regions, such as Germany or Europe as a whole, are also dependent on ecosystem services, not only in their own physical environment but also increasingly else-

where (for Germany: Wuppertal Institut 2008). This is not only the case for climate change and regulating services. If we consider, say, Europe and Japan's consumption of shrimps, we become aware that it is dependent on shrimp farming in South-East Asia and other regions, which destroys the mangrove forests there so that they are no longer able to provide regulating and supporting services for local people. Similarly, the consumption of fish in Europe and Japan depends in part on extensive fishing off the West African coast such that the fishing grounds there are becoming depleted, with adverse implications both for local people and for consumers elsewhere (Kaczynski and Fluharty 2002).

Shaping relationships with nature thus comes up against complex dependencies at and between different interconnected scales or levels (for more detail on this, Görg 2007; Görg and Rauschmayer 2009). Even just to record the processes – and more so to shape them – requires taking highly complex interactions into account. As experience over the last few years has shown, the process must also bring together different forms of knowledge, including local knowledge about the impacts of ecosystem change in particular regions, social scientists' evaluation of their societal consequences and natural sciences assessments of ecosystem change (Reid et al. 2006, Carpenter et al. 2006, 2009). What is particularly difficult to estimate, however, are the external impacts of the use of ecosystem services in other countries and regions, indicating the existence of dependencies beyond the boundaries of particular regions. Trans-regional linkages emerge here, that is, dependencies between forms of human use ("demand" side) and the state and functioning of ecosystems ("supply" side of ecosystem services) across various regions and spatial scales, e.g. between changes in local or regional land use (i.e. deforestation in the Amazon or the drainage of moorland in Siberia) and global climate change. Such trans-regional linkages can be seen

as a special case of cross-scale interactions which lead to a particular form of spatial externalisation of environmental burdens (we have referred to these elsewhere in terms of a ‘misplacement’ of environmental degradation; *Görg and Rauschmayer 2009*).

The challenges facing any kind of political steering or reshaping of such dependencies and the resulting environmental burdens are considerable and go far beyond the ideas discussed to date concerning multi-level governance (*Görg 2007, Flitner and Görg 2008*). Moreover, they also challenge approaches dealing with the resilience of socioecological systems (*Folke 2006*), because of the spatial mismatch of social and ecological processes, operating in different regions of the world. Regulating social-ecological system interrelations, thus, is a highly contradictory process. On the one hand, it is necessary to address the problems at a local level and to incorporate a variety of types of knowledge in that process. This includes scientific knowledge of the systemic interrelationships between biotic and abiotic factors and processes (precipitation, condition of the soil, ecosystem functions and their consequences, e.g. resilience of ecosystems), social scientific knowledge concerning societal causes and potential consequences (of an economic, social and cultural nature), as well as local tacit knowledge or indigenous forms of knowledge. On the other hand, it is becoming less and less possible to influence such dependencies at the local scale (or even at the regional or national scale), since global markets, international or regional policy measures, and national legislation act together to define and constrain the broader setting. Even indigenous ways of life are severely affected nowadays by such global and national contexts and can often be defended only at the international level (as an example of such processes of glocalisation, e.g. *Görg 2005*).

Climate change adaptation, thus, is not simply a matter of regional measures, as sometimes as-

sumed, nor is climate mitigation solely a global issue – the interplay of the various levels is crucial in any case (*Mickwitz et al. 2009*). Moreover, societal relationships with nature are being articulated in a multiscale manner due to the interlocking of neoliberal globalisation and global environmental change. At and between the various levels of action we are dealing with a plurality of relationships with nature which are infused with various societal and biophysical processes. In addition, we are dealing with growing social inequalities at and between the various levels and, at the same time, with existing or even increasing dependencies on the services provided by nature. It is important here not to forget the power relations that exist between the different manifestations of societal relationships with nature, power relations which have often inscribed themselves onto these relationships with nature themselves (*Bryant and Bailey 1997*). Thus the capacity of actors to shape their relationships with nature is dependent ultimately on global power relations – as is the case, for example, with the fisherfolk off the West Africa coast who are faced with the superior economic-technical and political power of the fishing fleets from Japan, China and Europe, which deplete their fishing grounds. The same goes for the small farmers of Sertão in Brazil, who are affected by the growing demand for biofuels triggered by climate policy measures in Europe and the USA as well as by geostrategic considerations related to cheap access to fuels.

5. Conclusions: Shaping Global Relationships with Nature as a Societal Task

To summarise: The previous remarks give evidence to the notion that we must address the challenge of adaptation to climate change within a wider context. This includes the claim for balancing mitigation and adaptation needs, but goes far beyond and includes not only several environmental problems, but also a wide range of

societal transformation processes. As we look at this set of circumstances described, we are justified in speaking of a comprehensive crisis of societal relationships with nature. This appraisal could refer to a host of scientific assessments regarding the (in some respects dramatic) state of the climate (IPCC 2007), ecosystems (MA 2005a), agriculture (IAASTD 2009) and oceans and soils. More than this, it reflects the increasing impotence of international agreements and national measures intended to solve the problems. In addition to rising CO₂ emissions, which not even the Kyoto Protocol has been able to restrict (nor was the Copenhagen Conference in December 2009 able to address this challenge properly), the Convention on Biological Diversity also appears to be facing failure in achieving its 2010 target, an objective, which was not particularly ambitious: to at least significantly slow down the loss of biodiversity. This is in addition to crises in the economic and financial sphere, which are also strong indicators of the fact that globalised societies are less and less capable of mastering the difficulties they themselves have caused and of shaping the mode of regulation imposed by neoliberal globalisation in a less destructive way.

The crisis in societal relationships with nature is thus closely linked to societal crises occurring on a global scale. Complex overlaps exist between processes of neoliberal globalisation and global environmental change as well as between the various aspects of global environmental change itself: between climate change, loss of biodiversity, soil degradation, the supply of drinking water, etc. It is becoming less and less a matter of the more technically oriented management of single, circumscribed problems and instead one of complex interactions between different biophysical and societal processes, which – due to their very complexity alone but more due to the manifold ways they are interlinked with societal interests and power relations – entail considerable challenges for

policy making. In addition to the economic and political processes involved, it is necessary to pay attention to the symbolic construction of these issues in the scientific field and the public sphere: How are these issues interpreted in science, politics and the public sphere and what follows from these understandings in terms of seeking possible solutions? The crisis of societal relationships with nature goes beyond the material reproduction of society in its conflictual interactions with nature, i.e. beyond processes of material flows in the narrower sense. It is affecting also the symbolic construction of nature and its role in the global transformation. This symbolic construction is also increasingly seen as a problem, making the intersections between science and politics, between science and economics or indeed between science and alternative forms of knowledge (indigenous or locally embedded knowledge) an issue to be addressed. How is nature constructed by various actors in economics discourse or in culturally-based symbolic discourse? What consequences does this have? And how can these processes be shaped actively?

In sum, during the current crisis and in the context of the debate about adaptation to climate change the idea of sustainable development returned in a new way: as a challenge for contemporary societies. Societies of both the 'North' and the 'South' are challenged to create a more sustainable way of "living within our limits". To meet this goal, however, the idea of sustainable development has to struggle with considerable contradictions, which goes far beyond simplified ideas of management the earth system. Two kinds of contradictions are especially relevant for our topic, even if they are not entirely new: contradictions between global and local/regional dimensions of the problem and between the overall societal dynamics and the opportunities for institutional policy making. The goal of sustainable development, on the one hand, has to address specific regional or local conditions – of climate im-

pacts, loss of biodiversity and degradation of ecosystem services – and, on the other hand, taking account of global markets, global power relations and interest constellations. Associated with this, albeit more serious in terms of their impacts, are the contradictions that arise with regard to institutional policy making. In the context of the current debate about climate change and rising prices for energy and food, societies' material dependency on nature has once again become an issue. Such material dependencies are increasingly articulated as global conflicts over resources, be it for access to cheap fossil fuels or the use of other mineral resources or ecosystem services (although these issues are often linked to one another, as demonstrated by examples related to growing biofuels or to the deforestation of the rainforest due to the discovery of crude oil or mineral resources). Institutions – especially international agreements set up in the wake of the 1992 Rio Conference – have proven to be increasingly out of their depth in the face of these problems. We could also call this the lesson learned from Copenhagen: They are less and less in a position to achieve the goals they were originally designed for, while national level implementation has also proved to be deficient. This can be taken as proof of the fact that both the extent and the dynamics of neoliberal globalisation as well as the complexity of problems in the post-Rio process have been underestimated (*Park et al. 2008*). Against this backdrop the postulate of sustainable development increasingly appears to be rather weak and in urgent need of fresh impetus. What is necessary is a new point of access to the challenges of shaping societal dependencies on nature, one that does justice to global inequalities and addresses power relations properly and supports demands for a more just and less destructive shaping of societal relationships with nature. Perhaps the current financial crisis is at least clearing the way for debate about a mode of regulation beyond neoliberal globalisation – although this is ultimately no longer a purely academic issue but a political one⁶.

Notes and Acknowledgement

¹ It would be too challenging to locate this approach in more detail within the wider discussions on social or political ecology, because there are links not only with social science approaches from political ecology (e.g. *Cronon 1995; Castree and Braun 1998*) or third world political ecology (*Bryant and Bailey 1997*), but also with human geography (e.g. *Swynedouw 1997; 2004; Harvey 1996; Keil et al. 1998*) and with research on social-ecological systems conducted on the border between ecological and social science research (dealing with concepts like e.g. resilience; *Folke 2006; Brand and Jax 2007; Bohle et al. 2009*). In the following only the theoretical foundation of this approach within the so-called 'Frankfurt School on Critical Theory' will be elaborated; for more discussion on this issue *Biro (2005)*.

² It was only once the anthropogenic causes of climate change had been proven that the climate issue became politicised, i.e. a field of political action: *Engels and Weingart 1997; Hulme 2009*.

³ At this stage we can leave open the question of the extent to which such variabilities are 'natural' in the sense of being 'untouched by human hand'. There certainly are indications that human activities have influenced the climate for a very long time, a view culminating in the thesis of 'Anthropocene' as a new phase in Earth's history (*Crutzen 2002*). But these indications are actually a clear sign that we can no longer maintain certain conceptualisations or ideas of nature – for example, the notion of nature as a force that infinitely exceeds human capacities to influence it (the 'end of nature' in this sense in *McKibben 1989*). At the same time, however, we are experiencing all the more painfully that we are less and less able to control these influences on the climate and, in particular, the impacts on society in turn triggered by them – to this extent we certainly are confronted with a nature that is different to our societies (we can call it 'Otherness'). On the difference between different cultural or scientific terms of nature and the theoretical term 'relationships with nature': *Görg 2003*.

⁴ These challenges are by no means posed solely by climate change adaptation but also by other issues in which the interplay of natural, or ecological, and societal processes are central, such as in the study of ecosystem services; *Carpenter et al. 2009*. As we

are going to see presently, these areas are all linked to each other.

⁵ Görg 2003; for a somewhat different approach, cf. Beck and Jahn 2006

⁶ Cf. the debate in Development Dialogue (No. 51, Jan. 2009) on the concept of post-neoliberalism

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- Summary: Shaping Relationships with Nature – Adaptation to Climate Change as a Challenge for Society*
- Climate change adaptation raises fundamental conceptual challenges and new research questions concerning the interplay of societal and biophysical processes. The paper discusses some of these challenges and introduces a theoretical concept able to improve our understanding of the complex interactions between nature

and society. The concept of 'societal relationships with nature', which is originated in the so-called 'Frankfurt School' of critical theory, provides a dialectic approach towards these complex interactions able to deal with the societal causes of climate change as much as with the repercussions of global warming on societies, including the claim for balancing mitigation and adaptation needs. To analyse these dialectic relationships properly, the scientific definitions and explanation strategies of climate change, their impacts on the political agenda and the discursive effects in the wider public must be scrutinised. Furthermore, it is necessary to establish an analytic framework capable of taking account of the ways in which climate change affects the overall reproduction of society, concerning the material-energetic input into societal development as much as certain limits in the appropriation of nature. Some of these challenges are discussed in more detail following the overall thesis that the issue of climate change adaptation throws up far-reaching challenges with regard to shaping societal relationships with nature on a global scale. Basically, the goal of sustainable development has returned on the agenda in a new form: To what extent are societies in the 'North' and 'South' respectively able to deal with the vulnerabilities created or heightened by climate change? In this context, the spatial dimension of climate policy at and between the different spatial scales is becoming an ever more pressing problem, which is illustrated using the transformation of ecosystem services as a case study. It will be argued that if we take all the environmental concerns, the social vulnerabilities and societal transformation processes connected with climate change into account, we are justified in speaking of a comprehensive crisis of societal relationships with nature. The crisis of societal relationships with nature, moreover, is closely linked to societal crises occurring on a global scale as is illustrated dealing with the complex overlaps between processes of neoliberal globalisation and global environmental change.

Zusammenfassung: Gestaltung der Naturverhältnisse – Anpassung an den Klimawandel als gesellschaftliche Herausforderung

Die Anpassung an den Klimawandel wirft grundsätzliche konzeptionelle Herausforderungen und neue

Forschungsfragen auf, die sich um das Zusammenwirken gesellschaftlicher und biophysikalischer Prozesse drehen. Der Beitrag diskutiert einige dieser Fragen und stellt dabei ein Konzept vor, das unser Verständnis der komplexen Interaktionen zwischen Natur und Gesellschaft zu erweitern vermag. Das Konzept der gesellschaftlichen Naturverhältnisse, das aus der kritischen Theorie der sog. „Frankfurter Schule“ kommt, entwirft ein dialektisches Verständnis dieser komplexen Interaktionen, das sowohl der gesellschaftlichen Verursachung des Klimawandels als auch den Rückwirkungen der globalen Erwärmung auf die Gesellschaft Rechnung trägt und auch die Anforderungen von Klimaschutz und Klimaanpassung gleichermaßen zu berücksichtigen versucht. Um diese dialektischen Wechselwirkungen angemessen analysieren zu können, müssen die wissenschaftlichen Konzepte und Erklärungsansätze und ihr Einfluss auf die politische Agenda sowie ihre diskursiven Effekte in der Öffentlichkeit untersucht werden. Darüber hinaus ist es notwendig, einen analytischen Rahmen zu erarbeiten, der den Einfluss des Klimawandels auf die gesellschaftliche Reproduktion, den materiell-energetischen Input für die gesellschaftliche Entwicklung wie auch Grenzen in der Aneignung der Natur zu erfassen vermag. Einige dieser Herausforderungen werden genauer untersucht; dabei wird die These vertreten, dass die Anpassung an den Klimawandel weitreichende Herausforderungen der Gestaltung gesellschaftlicher Naturverhältnisse aufwirft. Im Grunde wird das Ziel einer nachhaltigen Entwicklung in neuer Form auf die Tagungsordnung gesetzt: In welchem Ausmaß sind Gesellschaften in „Nord“ und „Süd“ in der Lage, den durch den Klimawandel verursachten oder verstärkten Verwundbarkeiten zu begegnen? Im diesem Kontext wird die räumliche Dimension der Klimapolitik auf und zwischen den verschiedenen räumlichen Maßstabsebenen zunehmend zum Problem, was am Fallbeispiel der Transformation von Ökosystemdienstleistungen illustriert wird. Die Umweltauswirkungen, die sozialen Verwundbarkeiten und gesellschaftlichen Transformationsprozesse, die mit dem Klimawandel zusammenhängen, zusammen genommen, kann man von einer umfassenden Krise gesellschaftlicher Naturverhältnisse sprechen. Diese Krise gesellschaftlicher Naturverhältnisse ist jedoch eng mit gesellschaftlichen Krisenprozessen im globalen Maßstab verbunden, wie sich an den vielschichtigen

Überlappungen zwischen neoliberaler Globalisierung und globalem Umweltwandel verdeutlichen lässt.

Résumé: Configuration des conditions naturelles – l'adaptation au changement climatique comme un défi social

L'adaptation au changement climatique lance des défis conceptuels fondamentaux et pose à la recherche de nouvelles questions qui ont trait à l'action combinée des processus sociaux et biophysiques. L'article discute certaines de ces questions et présente un concept qui permet d'élargir notre compréhension des interactions complexes entre la nature et la société. Le concept des rapports sociaux avec la nature, qui a son origine dans la théorie critique de l'« école de Francfort », fournit une approche dialectique de ces interactions complexes qui prend en considération les causes sociales du changement climatique ainsi que les répercussions du réchauffement planétaire sur la société tout en tenant compte des exigences de la protection et de l'adaptation climatiques. Pour pouvoir analyser de manière appropriée ces interactions dialectiques, il faut examiner les concepts scientifiques et les stratégies d'explication, leur influence sur l'agenda politique ainsi que leurs effets discursifs chez le grand public. Par ailleurs, il est nécessaire d'élaborer un cadre analytique qui permette de cerner l'influence du changement climatique sur la reproduction sociale, l'intrant énergétique et matériel pour le développement social ainsi que les limites de l'appropriation de la nature. Certains de ces défis sont examinés plus en détail en

défendant la thèse que l'adaptation au changement climatique lance des défis de grande portée à la conception des rapports sociaux avec la nature. Au fond, l'objectif d'un développement durable est inscrit sous une forme nouvelle à l'ordre du jour : dans quelle mesure les sociétés du « Nord » et du « Sud » sont-elles capables de faire face aux vulnérabilités causées ou aggravées par le changement climatique? Dans ce contexte, la dimension spatiale de la politique climatique aux et entre les différents niveaux d'échelle spatiale devient de plus en plus un problème, ce qui est illustré par le cas exemplaire de la transformation des services d'écosystème. Si l'on prend ensemble les conséquences sur l'environnement, les vulnérabilités sociales et les processus sociaux de transformation qui sont en relation avec le changement climatique, on peut parler d'une crise globale des rapports sociaux avec la nature. Cette crise des rapports sociaux avec la nature est toutefois étroitement liée aux processus de crises sociales à l'échelle planétaire, comme le montrent les chevauchements complexes entre la mondialisation néolibérale et le changement planétaire de l'environnement.

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